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used simultaneously. Additional PC must have a network adapter, sold separately. AOL is a single-user system and will not allow multiple users to access simultaneously under the same account. Other Internet Service Providers may h
download transmission rates are currently unknown, may not reach 56 Kbps, and will vary with line conditions. [8]6X DVD-ROM Drive transfer rate is up to 8115 Kbps compared to 1352 Kbps for 1X DVD-ROM Drives. [9]8X DVD-ROM c
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JBL Pro Amplified Speakers
10 Mbps Home Phoneline Networking[5]
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24X Max CD-ROM Drive[6]
Trident CyberBlade Hardware Accelerated 3D Graphics with 4 MB Video Memory
56K ITU V.90 PCI Modem[7]
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256 KB Integrated "On-chip" cache

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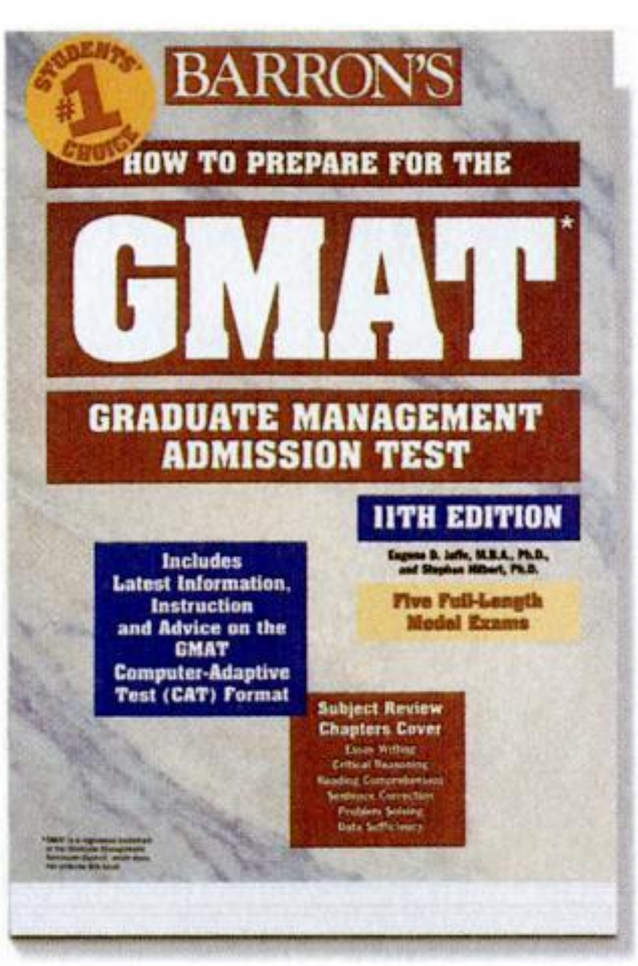

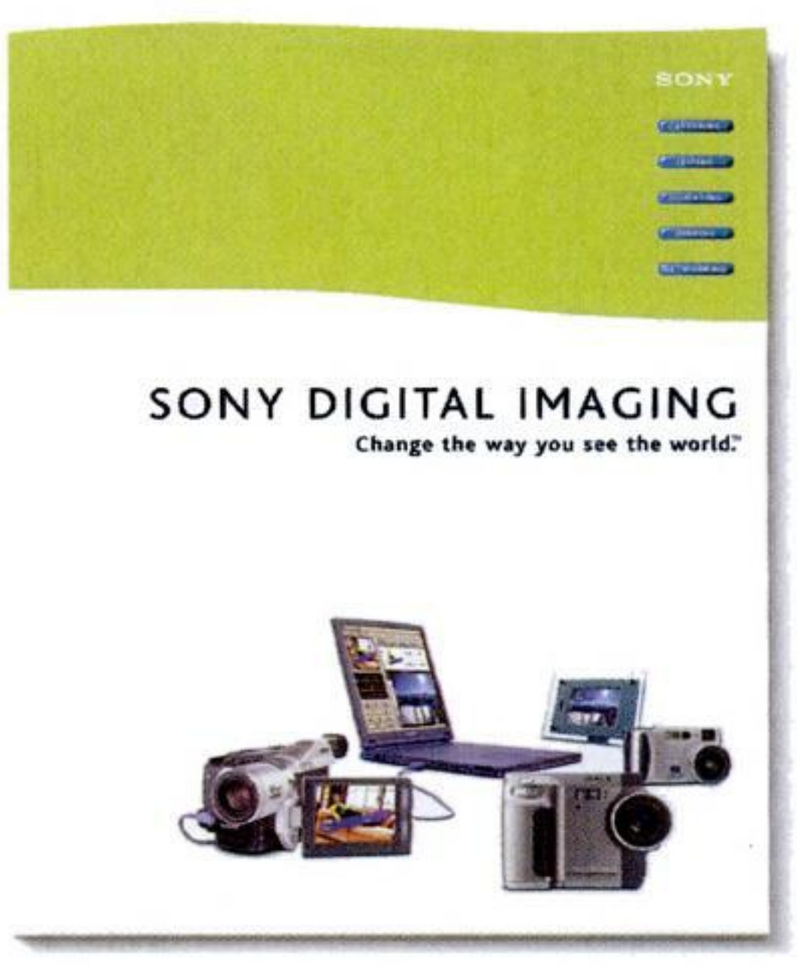

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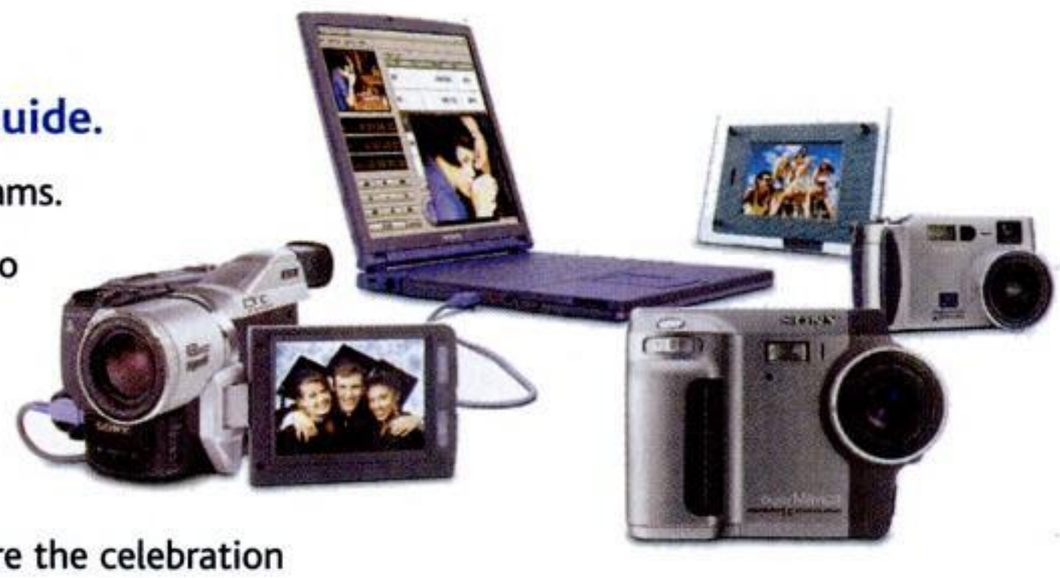

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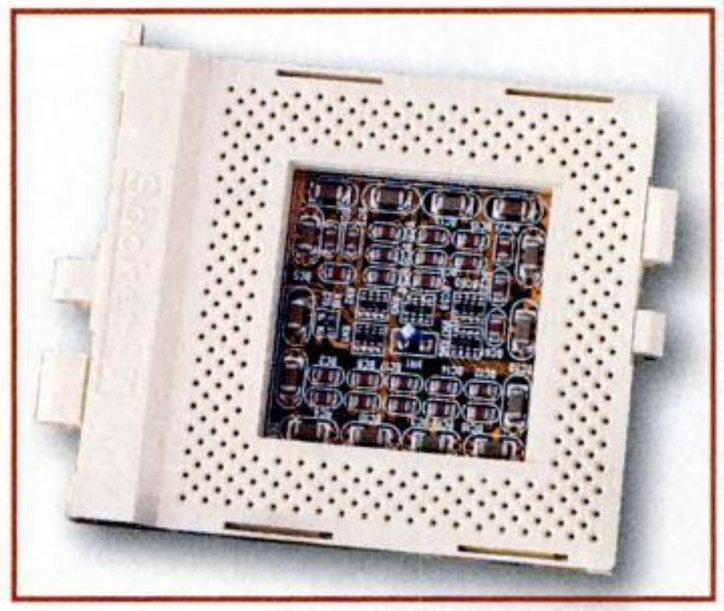
JULY 2000

THIS ISSUE

34 Upgrade Bible

50 Powerware



60 Socket Guide

FEATURES

34 And Ezekiel said:
"The path of the righteous PC is beset on all sides by the iniquities of the mediocre CPU and the tyranny of crap videocards." Don't shop until you've read our ultimate upgrading Bible.

50 It's tool time
Sick of the lackluster Play Skool utilities that ship with Windows 98? It's time to stock your workbench with some real power tools. We sort through the Internet for the best free and low-cost utilities.

60 Sockets, Slots, and Slockets, Oh My!
The Maximum PC Council on Motherboard Standards presents Your Field Guide to CPU Interfaces.

TECH FILES

23 Watchdog
Vendors warn of bogus Athlon CPUs, and Hi-Val goes down for the count.

69 White Paper
BX, ZX, KX133. If you can't make sense of this alphabet soup, learn some chipset shop talk.

73 Ask the Doctor
Internal vs. external DSL, and IRQ steering, explained this month by the Doctor.

PRODUCTS

27 Peripheral Vision
What do Barnaby Jones and Huggy Bear have in common? Both own the E-Holster. Also: PocketMail's amazing acoustic mail device makes it to the Palm, and Sharper Image's Digital Alcohol Breath Tester is the ultimate drinking game.

76 Reviews
Alienware's Kick Ass award gets abducted... Plextor and Smart & Friendly **12x CD-RW drives** hit the skid pad... Four years in the making, millions spent, and loads of hype give us **Daikatana**... Arcade driving sims get a boost with **Need For Speed: Porsche Unleashed**, and VW Beetle fans thrash the mud in **Beetle Buggin'**... Boston Acoustics and VideoLogic vie for the **baddest speakers around**... **Hunting**, **fishing**, and **NASCAR**, need we say more?... Retrospect **Express Backup** gives your CD-RW a tape-like personality... Sony resurrects MiniDisc for a **DV cam**... McAfee and Enova try to **protect your privacy**... ADS makes **FireWire storage** portable...**Cheap sound-cards** are mediocre... A gaggle of **newbie web tools** run the quality gamut.

NEWS

18 Inside Sources
PC Previews, News, and Factoids
Do we have a deal for you! The free PC offers disappear. Also: Microsoft's new "OS for the millennium" revealed.

VOICES

8 Ed Word
Top cat **Jon Phillips** answers your most frequently asked questions. And, no, you can't have our GeForce card.

13 CommPort
We write articles. You respond with letters. We respond to your responses. Children laugh. Old men cry.

29 Fast Forward
Microsoft's X-Box strategy is no replacement for the PC, says processorologist **Tom Halfhill.**

31 Game Theory
T. Liam explains why space-combat sims sagged, and how *Allegiance* may give afterburners to the tired category.

104 Glitch
E3 2000 suffered a surfeit of righteous ta-tas—read about the fallout in the latest edition of the *Daily Glitch*.

On the cover:

- Upgrade Bible 34
- Alienware 78
- Powerware .. 50
- Daikatana 81
- Sockets, Chipsets .. 60, 69

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EDWORD

Maximum FAQ

Month in and month out, we receive the same questions about the inner-workings of the magazine. So, at the risk of erasing the whole *Maximum PC* mystique, we here-with provide some answers...

▶ *Do you give away products that have already been reviewed?* No. We receive all products on extended loan—they aren't ours to give away. Even more importantly, we need to maintain a complete library of every product we review. We never know when we'll need to reach back in history to troubleshoot a reader's problem, or run comparative tests that put a new product in perspective.

Ideally, we would buy all evaluation products off the shelf, but we don't have that kind of operating budget, and this strategy would force us to publish reviews at least a month behind our competitors. In fact, with our two-month lead time, we actually need to receive a product long before its official shipping date in order to keep our reviews timely. The only way to get products this quickly is to solicit them directly from the manufacturers.

▶ *Do advertisers and vendors lavish gifts on editors?* Some try—game companies are the worst offenders—but we don't accept freebies of any real value. *Maximum PC* editors have rejected everything from a $50 bill (part of an ongoing PR stunt for *Light and Darkness*) to a free trip to the All-Star Game, ostensibly to review a baseball sim. While we don't think accepting expensive gifts would influence our product reviews, it could still cast doubts on our integrity. Basically, we accept T-shirts and travel mugs, and anything we can eat or drink during a single work day (we have yet to receive expensive wine or caviar).

▶ *Do I need a formal education in computing to work for a hardcore computer magazine?* No. In fact, no current *Maximum PC* editor has any formal computer training. All of us share a deep passion for PCs, and some of us have formal publishing training. We're just a bunch of guys and gals who've discovered we have the unique ability to both understand PCs and share our knowledge with others. Whenever we do hit a technological brick wall, we go to the people who actually get their hands dirty on the silicon and coding level.

▶ *What computers do you use to produce the magazine?* All component and game reviews are conducted on our P-III 733MHz test beds, but we do our actual writing, web surfing, and e-mailing on standard-issue Imagine Media computers. Configurations vary, but the specs hover around a P-III 600MHz, 128MB PC133 SDRAM, and 32MB TNT2 Pro videocard. Our Art staff works on Apple G4s. That's right: We have Macs among us! In part-by-part comparisons, the G4 may not be as powerful as the best PCs, but *Photoshop* does elegantly hook into the G4 architecture, and our company's production department won't accept *QuarkXpress* files created on the PC.

While we don't think accepting expensive gifts would influence our product reviews, it could still cast doubts on our integrity.

▶ *Who is the Watchdog?* It's high time we give credit to News Editor Gordon Mah Ung for his dogged consumer advocacy reporting. Gordo is an expert at searching public records, and has an uncanny knack for finding the unlisted phone numbers of deadbeat CEOs.

▶ *Joey, do you like gladiator films?* Depends. Who's starring—Russell Crowe or Tony Curtis?

—Jon Phillips, editor-in-chief

MAXIMUM PC

JULY 00 vol5issue7

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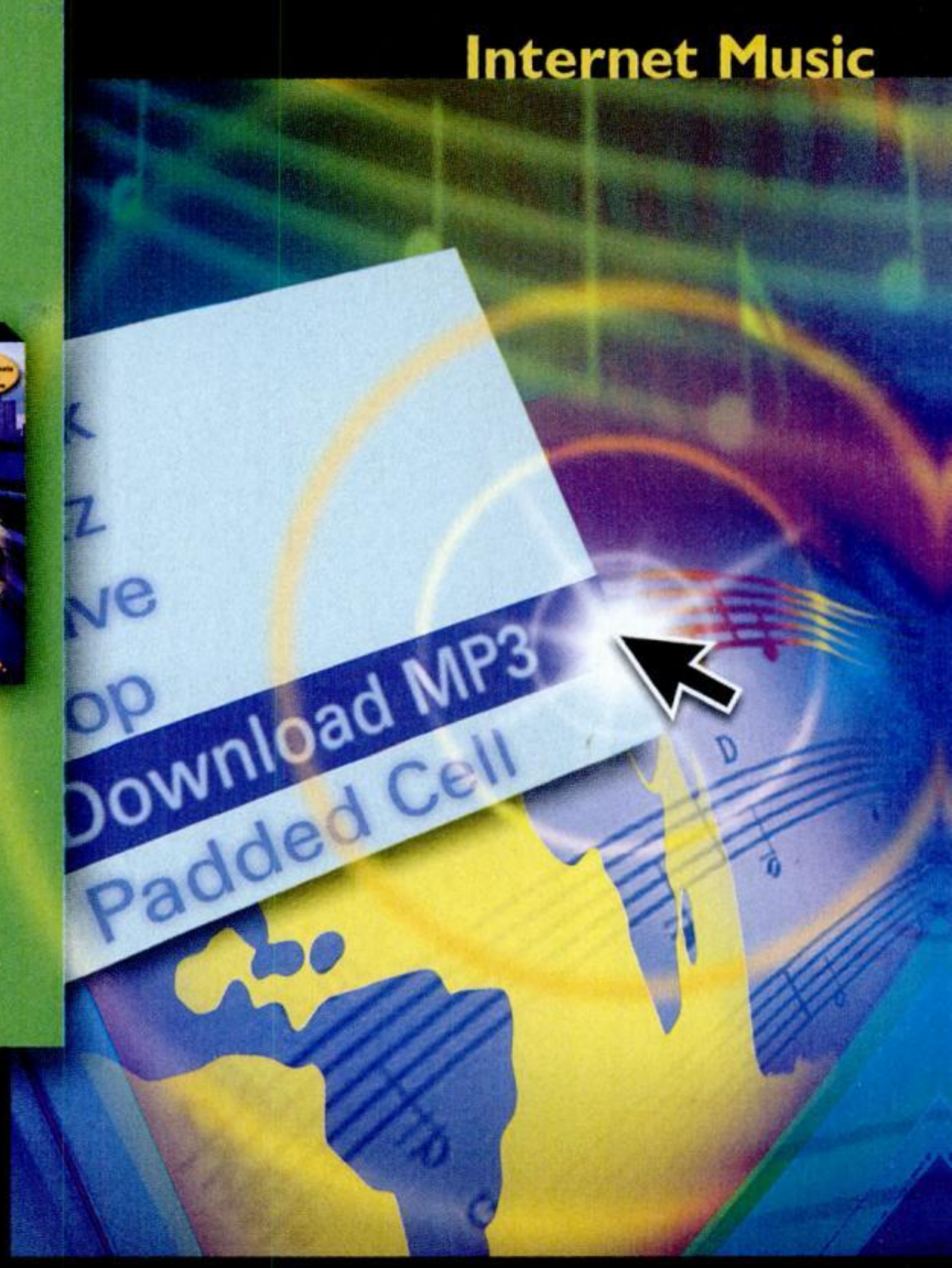

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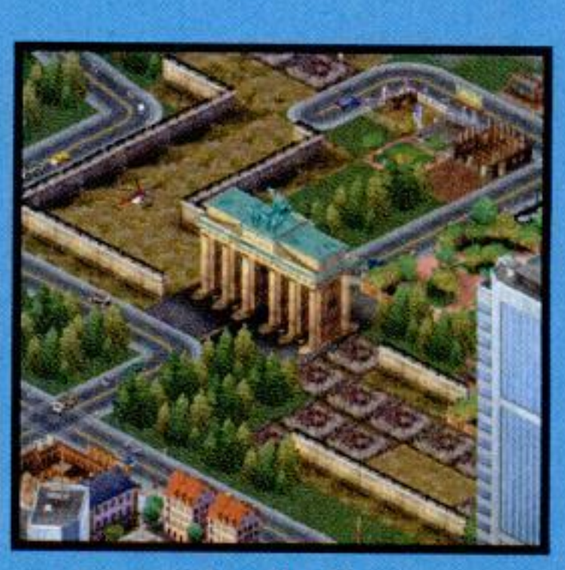

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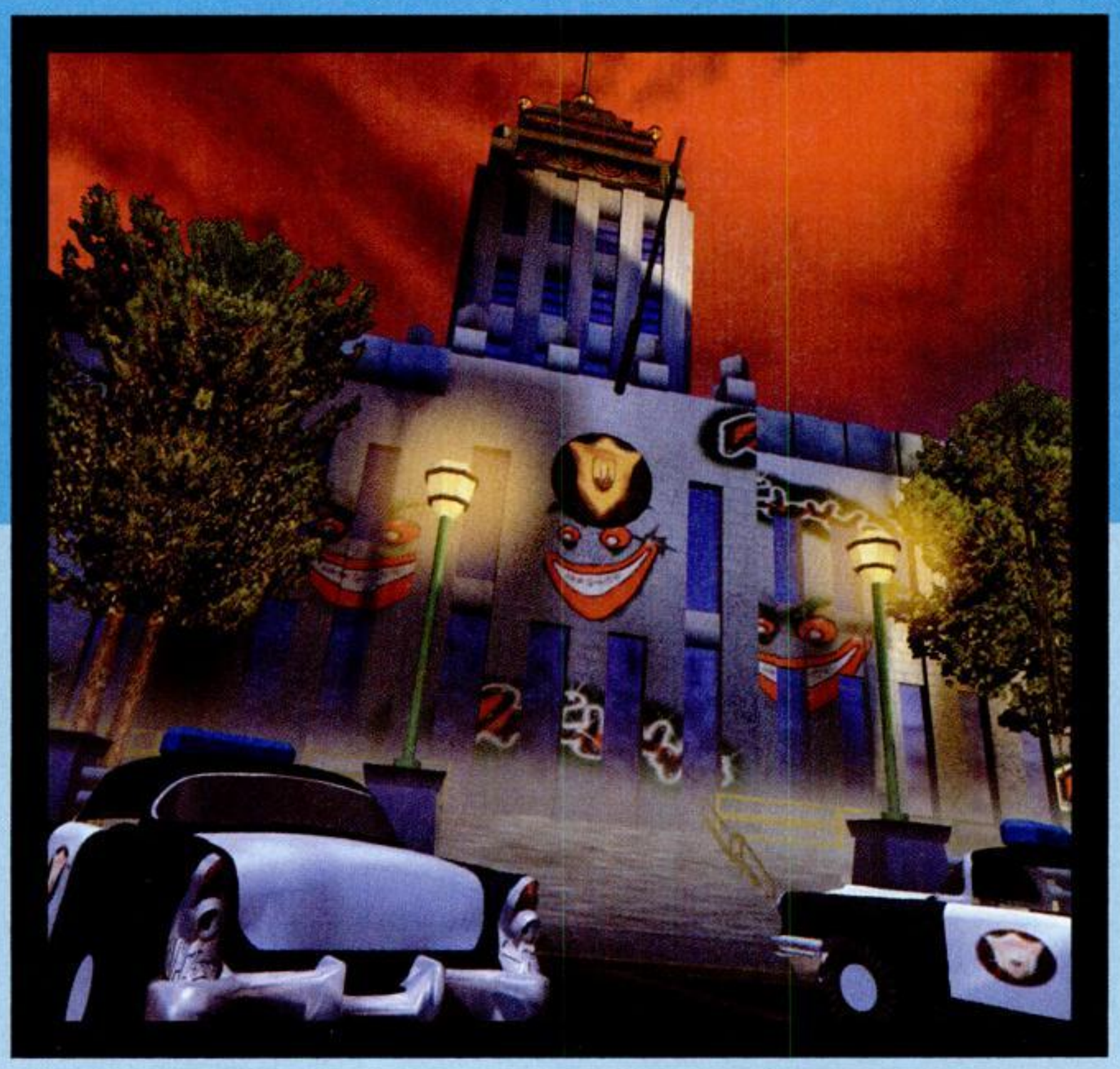

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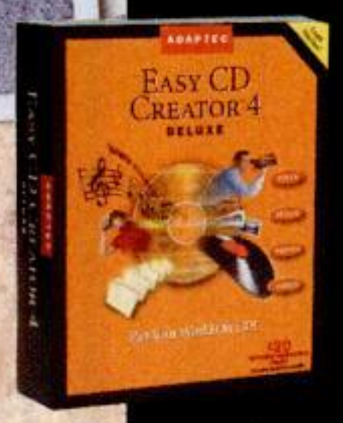

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What's a Few Megahertz Between Friends?

You haven't seen balls-out fury until you've been e-mail-bombed by *Maximum PC* readers waging a correction campaign. Woe to the wretched soul who would kindle their wrath! In the May issue, we edited (for length) the introduction to an infographic, and inadvertently distorted the history of integrated circuits. The protest letters arrived en masse, and we learned, once again, that you can't get anything past our eagle-eyed readers. Check out Bob Stek's letter below for the straight poop on the speed of IBM's first PC.

Our more exacting readers also called Fast Forward columnist Tom Halfhill to the carpet. In the same infographic that included our IBM gaffe, Tom authored a sidebar explaining how chip companies reach faster clock speeds. In a key sentence about circuit paths, Tom used the word "thinner" when he meant to write "shorter." As soon as the magazine hit newsstands, all hell broke loose, and readers rushed him in protest. Tom clarifies the science of integrated circuits on page 17.

Being gang-tackled by readers is never a fun experience, but we wouldn't have it any other way. Your meticulous attention to detail reminds us that anything short of 100 percent accuracy is unacceptable, and this ultimately helps us produce a better magazine. Keep the letters coming!

And What a Wee CPU It Was...

I've been on the "bleeding edge" of technology since the days when a personal computer ran at 2MHz and had switches and blinking lights on its front panel (I still have my IMSAI and Proc Tech SOL-20 to prove it). So I guess I'll have to add a few more grains of salt to your recommendations if you can't even get your PC history correct. I would've loved to have seen IBM's Personal Computer from June of 1979 running an 8MHz 8088. It would have been a lot more advanced than the Personal Computer IBM initially brought out in the fall of 1981 running an 8088 at 4.77MHz. (P.S. I once overclocked my 2MHz SOL 8080 to nearly 2.5 MHz. Now that was exciting!)

—Bob Stek

Editor-in-chief Jon Phillips replies: The bottom line is that our CPU timeline was correct, but our history lesson was wrong. Bob clearly knows his PC history, so we asked him to put the 8088 matter in context. Bob explained that, while Intel announced the 8MHz 8088 in 1979, IBM didn't initially latch on to the CPU: "It took IBM from June 1979 until October 1981 to decide to get into the personal computer business and 'legitimize' it. In other words, IBM figured out there was a market for personal computers only after Apple, Commodore, and Radio Shack opened up the 'home' market (as opposed to the S-100 'hobbyist' market)."

The way Compaq "spliced the IDE cable..." is the best idea I've seen in years.

SETI Septuplets

On page 73 of your May issue, you say that you had seven *SETI@home* sessions running on the Dell you're "putting through hell." Just how did you manage that? I can't get more than one running. Are you using Linux or something?

—Spungy

News editor Gordon Mah Ung replies: For the uninitiated, SETI stands for "Search for Extraterrestrial Intelligence." The software unobtrusively recruits your PC's processing power to aid in a worldwide effort to locate E.T. With thousands upon thousands of Internet users downloading and analyzing radio telescope data in concert, the SETI project represents distributed number-crunching at its most poetic. You can get multiple SETI sessions to run simultaneously by running the command-line version (which is not multi-threaded). Just be sure to run the individual executables in separate directories.

Kudos to Compaq

The way Compaq "spliced the IDE cable that connects the optical drives" in its 1GHz Presario system (May issue, page 75) is the best idea I've seen in years. I tried it on my Athlon 700, and it worked like a charm. It helped open up the inside of my case for much better air flow. From now on, this will be standard practice when I put together or upgrade a system. I'm thinking of trying it on the floppy cable as well.

—Rick Smith

Glitch Makes Him Itch

I found your May edition of Glitch less than amusing. As far as the comment about IBM's OS/2 Warp operating system, I did *not* find that particular little segment funny at all. I found it: 1) highly inaccurate, and 2) highly offensive to those of us

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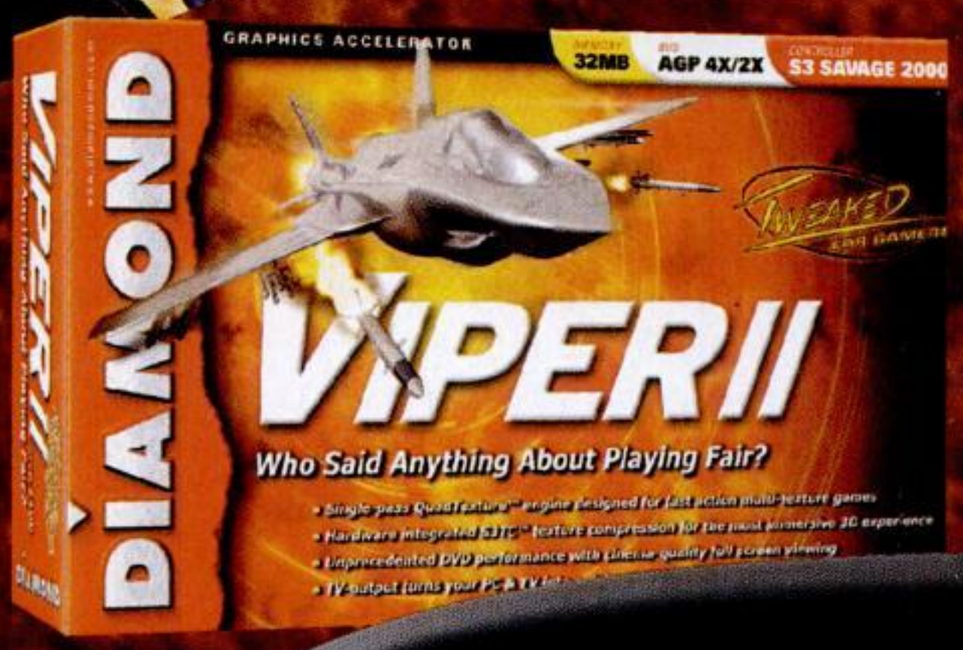

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who use OS/2. I was considering purchasing a subscription, but after reading that pathetic put-down of an OS you obviously have never used and know little or nothing about, I don't see what the point would be. Frankly, I'm very disappointed to see the intelligent "Magazine That Boot Was" turn into nothing more than a magazine that parrots Microsoft opinions.

—Gerald P.

Editor-in-chief Jon Phillips replies: We grant that our news item ("OS/2 Deemed 'Irrelevant' By Pan-OS Council") was a bitter pill to swallow, but we stand by the accuracy of our reportage. Is it *not* true that the Pan-Operating System Council of Elders declared OS/2 "Operata Non-Grata"? Is it *not* true that OS/2 enjoys its greatest popularity in Uganda and pockets of Sudan? Is it *not* true that 35 to 45 OS/2 users nest in underground hovels and effluvial drainage pipes? The facts are self-evident—*they cannot be denied*. As for your opinion that we kowtow to Microsoft: Poppycock! Retract your dastardly comment, sir, or a duel we shall have!

The Pre-Fab Debate Continues...

Your May Commport response to Justin Key (who configured a $1,500 PC that he believed could beat those reviewed in the March issue) left out a couple of important points. Justin conceded that he came in $50 over budget, but he stood behind the quality of his system versus the cheap pre-fabs. Here's where you should have attacked:

1) Justin's system required online or mail orders from 15 different vendors. At an average shipping cost of $8 to $10 per item, that adds $150 to his system.

2) Dealing with 15 different vendors increases the probability of incorrect shipments, and breakage while shipping.

3) Time is money. Any "average tech" (to use Justin's term) is earning at least $40 an hour. I can see an investment of 10 to 20 hours managing these shipments and assembling this system. This could add a minimum of $400 to the final cost. Now Justin's system costs well over $2000.

I'm an "average tech" myself, and have built systems before—but it's a chore. I just bought a new system this week from Micron. They managed the build, they managed the delivery, and they offer next-day, onsite tech support if there's a problem. Try putting a price on that.

—Ron Schonscheck

Registered Memory—Why?

This question arose while reading your article on VIA's Apollo 133 core-logic chipset: What are "registered" DIMMs?

—Fabian Hasse

News editor Gordon Mah Ung replies: Registered DIMMs employ dedicated registers (small data storage cells) that help govern memory traffic. The registers are imperative in 512MB (and larger) memory modules that contain a lot of individual memory chips. When you have multiple chips working at the same time, data traffic can become unwieldy—yet microprocessing has no patience for chaos, so measures must be taken to ensure precise signal timing. A registered DIMM delays the SDRAM signal by one clock cycle, lines up the data in correct form, then writes to the memory chips, all in one fell swoop.

I was in the Marines from 1990 to 1996 as a small computer systems specialist, and I never once saw black PCB in any system.

Registered DIMMs are generally used in server-level motherboards where you would use 2GB or more of total memory. Some motherboard chipsets require registered memory, and others don't. A chipset that hasn't been designed to control vast amounts of memory must defer to the registers on the DIMM itself. And sometimes, module makers use register chips to create cheaper modules. For example, instead of using eight 256MB chips to make a 256MB module, the company uses 16 128MB chips (which are much cheaper) and employs a register chip to control the extra memory chips.

You cannot mix and match registered memory with unbuffered SDRAM. If you plan to buy a honking-huge 512MB registered DIMM, you'll need to retire that 128MB unbuffered DIMM.

At Least It Costs Less Than a Military Screwdriver

"Holy cow turd" better describes the AXBC Pro II motherboard that you previewed in the April Peripheral Vision. You describe it as "a work of both art and science." Art, maybe. Science, naah. The black "military" spec PCB does look cool, but I was in the Marines from 1990 to 1996 as a small computer systems specialist, and I never once saw black PCB in any system.

The board does look pretty, but gets really ugly when you discover it only supports 2x AGP. The BX is a solid chipset, but 4X AGP is a must for *Maximum PC* readers. May I suggest a can of black spray paint and an i820 motherboard? Throw this board in the toilet that was reviewed in the blurb above it.

—Tim Parks

Underhanded Underclocking

I ordered what was advertised as a "Cyrix 266MHz" system from Buy.com. When it arrived, I started performing some tweaks and benchmarks. I was browsing through *SiSoft Sandra*'s report when I noticed that not only was the CPU identified as a 200MHz unit, but that the 66MHz clock speed was coupled with a multiplier of 3.0, giving the CPU a true speed of 200MHz.

I double-checked all the system literature, and everywhere it stated that the machine was indeed a 266MHz system, and not just an arbitrary 266 model number, which in itself would be pretty sneaky. I contacted Buy.com, and they referred me to Cyrix's web site. Is there a rational explanation for Cyrix selling a disguised 200MHz CPU as a 266MHz product?

—Chip Adams

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Editor-in-chief Jon Phillips replies: Cyrix (now owned by VIA) has long marketed its CPUs by touting "performance ratings" rather than the actual clock frequencies at which its chips run. Cyrix determines its ratings by comparing its chips' performance to that of similar x86-compatible CPUs, and then passing judgment on the chips' relative power. So for example, if its 200MHz M-II processor performed like a 266MHz Pentium MMX during testing, Cyrix would call that particular M-II processor the "M-II 266" (or "M-II 266PR," with the "PR" designating "performance rating").

Cyrix has argued that its chips deserve special consideration for architectural improvements that boost performance beyond that which can be described by mere megahertz ratings. Well, guess what? We think this hokum flat-out sucks!

First, Cyrix makes no effort whatsoever to enlighten consumers as to how it compares performance. What benchmarks does Cyrix use? Does floating-point come in to play? Does an impartial third-party have any say in Cyrix performance ratings?

Second, the rest of the processor industry uses sheer clock speed as the basic measure of performance, so by flouting convention, Cyrix confuses comparative shopping. While power users know that architectural differences can affect performance, most newbies concentrate on sheer speed specs. Conveniently, Cyrix makes only low-end CPUs intended for first-time system buyers. So, when these newbies enter CompUSA and begin comparing system specs, they hone in on the relatively big numbers that accompany Cyrix CPUs, thinking they've found a great deal. Without a doubt, the whole performance rating scheme reeks of exploitation.

The saving grace is that Cyrix and its retail partners cannot in good faith attach an inaccurate megahertz rating to a CPU. And, in fact, Cyrix has actively avoided misidentifying its products with actual speed ratings, leaving off the "MHz" suffix, or attaching the (albeit vague) "PR" suffix. But some retailers have wholly misrepresented Cyrix CPUs by attaching the "MHz" suffix after the fact. If you're describing your situation accurately, we believe Buy.com owes you some sort of make-good.

Notebook Capacity Fraud?

Has anyone noticed that laptop vendors are apparently cheating buyers regarding hard drive specs? Some vendors cut costs by not including system recovery CDs with their units. Instead, they partition the hard drives to incorporate this data, ostensibly for quicker crash recovery. While that may be all well and good, it means that buyers are not getting all of the usable hard drive space they're paying for.

I visited the local Best Buy and CompUSA outlets, and examined all the laptops on display. All of the Compaq, Sony, and Toshiba units had partitioned hard drives. Hewlett-Packard machines were not partitioned. Putting recovery data on the second partitions consumed an average of one-third of the advertised capacity of the drives. For example, a Compaq unit advertised at 6GB had only 4.2GB available on the "C" drive (including the OS and software). The "D" drive consumed the rest of the space. According to some sources, these drives cannot be repartitioned to recover that capacity without a full reformatting of the drive.

Is this misrepresentation at best, and fraud at worst?

—Arthur E. Petersen, Jr.

Associate editor Geoff Visgilio replies: Some would call it cheating, others would call it catering to corporate consumers who either aren't smart enough to recover their own crashed notebooks, or don't like to lug around external CD-ROM drives. It's not outright fraud because the drives in question still technically hold their advertised capacity.

By sectioning a hard drive into two partitions, the manufacturer isolates a safe area for recovery data. Compaq and Toshiba—two of the three largest suppliers to corporate consumers—use this system for corporate clients who have the average newbie's PC knowledge base. These notebooks aren't intended for PC tinkerers; they're intended for newbies who run to their local tech support maven when something goes awry. If the recovery software is on the notebook, a tech can fix it without tracking down the user's inevitably missing CD-ROM, or hooking a CD-ROM drive to a machine that lacks an internal one.

Sony partitions its VAIOs' drives, but this is for split storage, not to stash recovery data. Compaq is notorious for loading its systems with proprietary Compaq software, so you may have a tougher time removing partitions. Nonetheless, when we reviewed a Sony VAIO and a Toshiba Tecra, both came with partitioned hard drives. We wiped them out using PowerQuest's *Partition Magic* to get all our usable space back. Dell, Micron, and Quantex do not partition their notebooks' hard drives.

Heads Up!

I thought your readers might be interested in this photo I snapped of my I/O Magic 56x CD-ROM drive. My son's favorite game is *NBA Live 99*. He used to play it every day. Two days ago, it wouldn't play, so he took the CD out and cleaned it. He noticed a small crack at the center hole, but didn't think anything of it. He put the game back in the drive, and it spun up like it was going to play—and then exploded in the drive!

The tray was blown out about three-quarters of an inch, along with the face of the drive. Pieces of the CD were thrown across the room. The drive was destroyed. I'm glad that I don't have a desktop computer, because my son probably would have been directly in front of it. I replaced the drive with a Kenwood 62x True-X drive because it has much lower rotational speeds, and actually performs much faster because of the Zen Technologies 7-beam design.

—Jon Ruyle

Reviews editor Josh Norem replies: We haven't been able to recreate this in the Lab, so we'll give a GeForce 2 graphics card to the first person who can send us a video clip of a CD-ROM drive blowing up in a similar fashion. We've heard of fast rotation speeds, but this is ridiculous.

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Pavlic Becomes Halfhill's Dog

In the May issue, there's a blurb by Tom Halfhill entitled "How to Reach a Faster Clock." I'm not sure he has enough of an understanding of processor architecture to post such an article. I was especially disturbed by this line: "Thinner wires have less electrical resistance."

Electrical resistance is directly proportional to length and *indirectly* proportional to cross-sectional area. If you make the wire thinner, you decrease the cross-sectional area and the wire becomes *more* resistant. If you're concerned about resistance, be concerned about the resistivity. That's where the difference between gold, copper, and aluminum come into play. Gold will have less resistivity than copper, and copper will have less resistivity than gold. Resistance is directly proportional to resistivity.

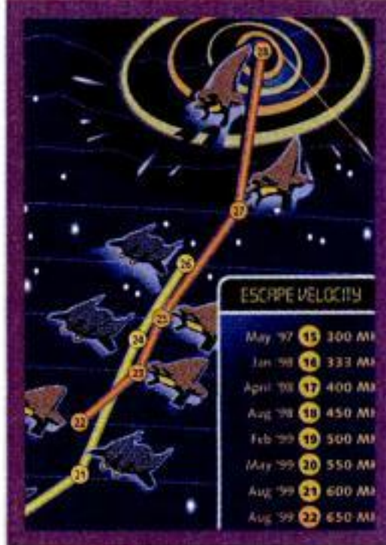
So a fast processor—specifically, one based on electronics (newer processors will probably be based on optics)—will have the following traits from a materials point of view: 1) small, effective channel length, and 2) low resistance (low resistivity, thick wires, short wires).

I also felt that the mention of silicon-on-insulator was out of place. If I had written the article, I *might* have mentioned the fact that IBM and Motorola are using copper in their PowerPCs, and that Intel and AMD are researching the possibility of using copper in their own chips, but I don't think I would have mentioned SOI. And if I *did* mention SOI, I would probably feel inclined to mention some of the many other advances in transistor technology. I might even have touched on the development of quantum wells in correlation to optical machines, which may eventually replace the technology in modern-day processors.

—Ted Pavlic

Contributing editor Tom Halfhill replies: I made a mistake in that sidebar, but your letter also contains some mistakes. I meant to write that shorter—not thinner—wires have less electrical resistance, although that too is a gross oversimplification. There simply wasn't enough room in that brief sidebar to explain all the factors that affect RC (resistance-capacitance) delay at submicron process geometries.

Shrinking a process from, say, 0.25 microns to 0.18 microns shortens the wires, which reduces capacitance, but brings the wires closer together, which increases capacitance—and makes the wires thinner, which increases resistance. However, the metal interconnect layers don't always shrink proportionally to the effective gate length (L-effective) of the transistors, which is what we usually mean by "0.25-micron" or "0.18-micron" in reference to an IC process. Often, to minimize resistance, the metal layers shrink proportionally less than the L-effective of the gates, so the interconnect wires get shorter and the vertical cross sections are not a lot thinner. But, in general, it is correct that RC delay (and the capacitance coupling of noise in the signal wires) becomes a more significant problem at smaller geometries. In the past, circuit delays were the big problem.



First you criticize a technology such as SOI that's real and here today, then you promote a technology that's still in the lab and will likely remain there for at least 10 or 20 years.

I'm surprised that you think my mention of silicon-on-insulator technology was out of place—especially in light of your emphasis on short L-effectives and transistor switching speeds. By reducing capacitance, SOI allows a transistor to charge and discharge its current more quickly, which is what switching speed is all about. Yes, SOI has been the focus of research for many years, as has the use of copper for metal layers. IBM's accomplishment was in perfecting a reliable SOI manufacturing technique, just as IBM (and Motorola, and others) have found reliable ways of applying copper layers without contaminating the silicon. SOI is a genuine breakthrough that no other company has yet matched.

IBM has tested SOI by making samples of the same PowerPC chip at the same geometry, in a copper process with SOI and in a copper process without SOI. Result: a 24 percent speedup with SOI. When the SOI process is further tuned to take advantage of the deeply stacked gates that SOI allows, experiments show a 50 percent speedup. That's huge. Potentially, it's the difference between 666MHz and 1GHz—without a process shrink! Furthermore, some researchers (not just at IBM) believe the problems caused by parasitic capacitance, electron tunneling, and other factors at L-effectives below 0.13 microns will become overwhelming for conventional CMOS processes. Intel's recently revealed notched-poly technique (which undercuts the gate poly to reduce overlap capacitance) is clever, but might be little more than a stopgap solution (no pun intended). SOI might be the best—or the only—solution, at 0.10 microns and smaller geometries.

It's a popular misconception—and one that I shared until recently—that gold is more conductive than copper. Silver is more conductive than copper by about five percent, but gold only seems more conductive because the barrier materials required to prevent copper from oxidizing reduce conductivity in typical applications. The advantage of gold is that it's more inert than copper—it doesn't oxidize, so it doesn't need protection against oxidation.

Finally, forget about microprocessors based on optical circuits. First you criticize a technology such as SOI that's real and here today, then you promote a technology that's still in the lab and will likely remain there for at least 10 or 20 years. Despite all the hype, circuits based on photons aren't necessarily superior to circuits based on electrons. Both technologies have their advantages and disadvantages. Electronic circuits will continue to dominate microprocessor technology for many years to come, as researchers struggle to solve the special problems of optical circuits.

CUT COPY PASTE

▶The Compaq Presario 5900Z-1GHz reviewed in the May issue includes a 250 watt power supply—not a 145 watt supply as we originally reported. The supply was marked as 145 watts, and Compaq confirmed it was 145 watts when we raised a red flag before publication. Compaq has since discovered its supplies were incorrectly marked. ✹

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trends ► newbie boxes

Behind the Free PC Fadeout

And why Information Appliances Might Stand a Better Chance for Survival

Sign up with Free-PC.com and get a Celeron-based PC, totally free. Not good enough? Enchilada.com will give you a free PC and upgrade it every two years. Too good to be true? Yes.

In the summer of 1999, companies such as Free-PC and Enchilada were among the first to try the "PC as cell-phone" concept. With cell phones, the hardware is free but you're gouged on the service. Free PC companies attempted to apply the same principle to PCs, betting on either advertising or partnering with ISPs for profits. In the end, giving hardware away for free turned out to be more a fad than a trend. Both Free-PC.com and Enchilada.com are out of business. Other free PC vendors, such as Microworkz, also went under, and the handful of remaining "free" companies—including Freemac.com, Intersquid.com and Gobi—declined *Maximum PC*'s requests for interviews.

What Went Wrong?

One early factor that cut free PC companies off at the knees was advertisers' unwillingness to pony up.

That was a severe problem for Enchilada.com. The company hoped to bolster an instant Internet portal by requiring those who received its free PCs to make Enchilada.com's URL their browser's home page.

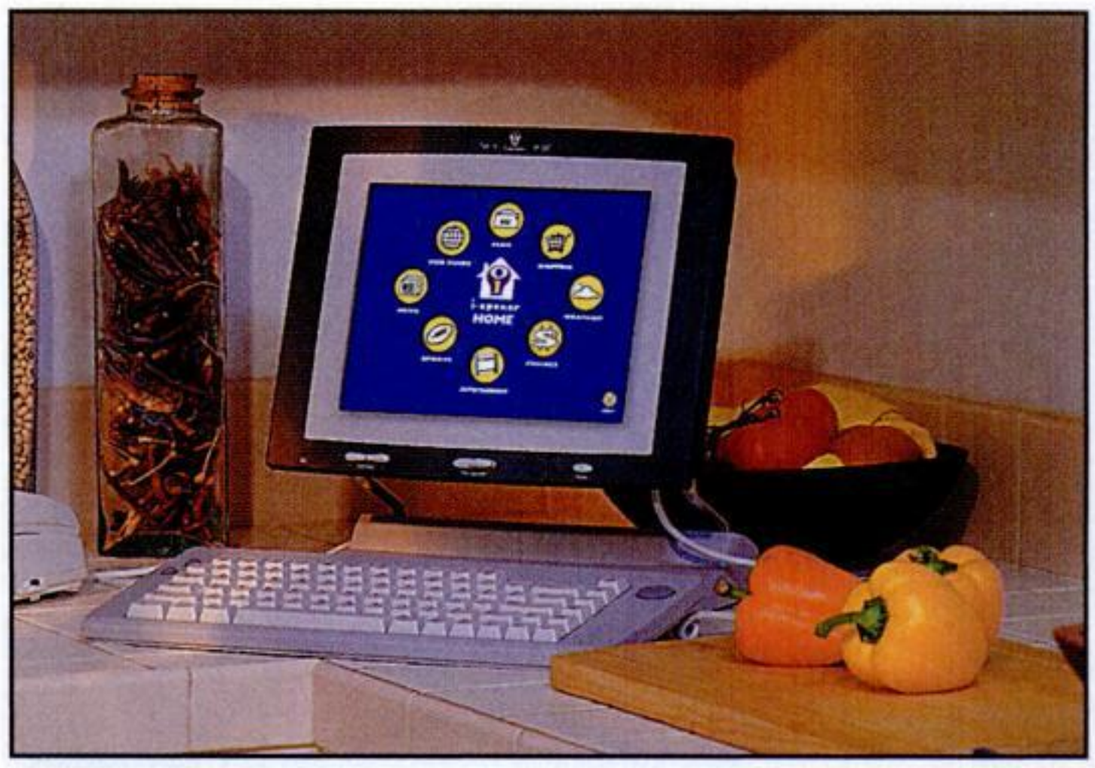
"We believed that the e-commerce bottom wouldn't fall out as fast as it did," Rick Latman, CEO of defunct Microworkz, says. "The free-flowing e-tailer dollars have all dried up."

Microworkz crashed with such velocity that it left consumers in the lurch and saw lawsuits from government agencies lock onto it.

Many of the start-up companies also weren't prepared to deal with the immense consumer interest. Microworkz promised to sell PCs with 12 months of free net access at $300. When Microworkz was featured in the *Wall Street Journal*, the company had but 10 employees. It ended up with thousands of orders it couldn't fill.

Hyped Out of Control

Fad pioneer Free-PC featured an offer that forced consumers to volunteer detailed demographic information and to view scrolling advertisements while offline and online. As distasteful as it sounds, tens of thousands of people lined up to get a PC. But, though the customers were there, the advertisers didn't show enough interest.



Though the free PC fad has ended, analysts say the business model may be a better fit with "information appliances" such as the I-Opener.

Steve Chadima, a former officer of Free-PC, said advertisers felt that the number of interested customers was too small to make advertising worthwhile (Free-PC ultimately gave out 25,000 PCs, which recipients were able to keep even after the company's demise). In the end, Free-PC was sold off to low-cost PC maker eMachines, which sells PCs in the $400 to $1,000 range.

Chadima, now with eMachines, says he believes Free-PC could have made it, but that the road to profitability would have been long and painful. Chadima says the hard pill to swallow is the cost of the PC. If free service ISPs can barely scrape by giving away net access, Chadima says he believes it's even more unlikely that small-fry companies can survive while amortizing the cost of an entire PC, even with long-term potential for garnering enough consumers to attract advertisers.

SPIN CYCLE

This month's top stories broken down ►

HEADLINE	NEWS	DETAILS	THE SPIN	OUR TAKE
Metallica Sues Napster	Rock band Metallica has sued Napster, asking it to ban some 300,000 people from its controversial MP3-swapping program.	Metallica gave Napster a list of usernames to ban from its service. Napster has complied with the request by implementing modifications to keep banned people away.	"We want to control how (our music is spread), just like we've always controlled what we make," said Metallica drummer Lars Ulrich.	Metallica says it's not the band vs. the Internet, but the reaction is stacking up to be just that. It's a bad PR move for the band, no matter what the outcome.
AMD Unveils New CPUs	Following the news that it had sold its entire allotment of Athlons, AMD will introduce four new CPUs this year.	AMD's Mustang will feature 2MB of full-speed cache, while the Thunderbird will pack 256KB. Also expected are the mobile chipset Corvette, and the Duron.	"If today's AMD Athlon processor is a home run, these new versions are grand slams!" says AMD.	By integrating the L2 cache into the proc cores and using copper interconnects, AMD's new CPUs will likely crush Intel's lineup until Intel can sortie its new Willamette.

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Information Appliances

Chadima says new businesses using cheaper "information appliances," such as Netpliance's I-Opener, stand a better chance of making it. The I-Opener features a 200MHz processor, dual-scan flat panel LCD screen, and 56K modem. Designed as only a browser and e-mail client, the I-Opener reduces the cost of an operating system by using its own.

But even the I-Opener isn't "free." The unit costs $99 and the ISP service runs $22 a month. If you fail to keep the service for more than three months, Netpliance can ding your credit card for $500. While the I-Opener looks shi-shi tech, its guts are pure PC. Hacks discovered this year let people convert the devices into fully functioning PCs.

Microworkz's Latman feels that Netpliance and similar start-ups can survive, but that the real problem with the network appliance concept—low-cost, easy-to-use machines designed only for net access—is that pioneering small-fry companies will eventually have to compete with the big dogs: America Online, Microsoft, and Sony.

"You can't subsidize PCs as network appliances against PlayStation 2s coming onto the market," Latman says.

Sony's super-game console is expected to eventually come equipped with Internet capabilities, making it a browser for the living room. Many also expect Microsoft to push net access with its upcoming X-Box gaming console, and America Online is expected to begin work on its own stand-alone device that lets users access AOL from anywhere. Latman doesn't see much wiggle room for companies caught between these juggernauts.

He especially takes issue with Microsoft's grip on the PC market. "It is not the per-seat cost [of Windows] that's the problem. It's Bill Gates' obsessive desire to control what America sees on the screen," Latman says. "If we can get some ego out of the way and just build a platform, we can be OK. That's not going to happen from Microsoft."

Free PC Legacy

Despite the failure of several high-profile free PC companies, experts say there will be long-standing fall-out from the companies' attempted coup d'etas.

The average selling price of a PC has dropped dramatically over the last three years. In September of 1997, the average price was $1,355, according to figures from market research firm PC Data. In September of 1998, that price fell to $1,087. At the height of the free PC craze last September, prices bottomed out at $790. In the months since the demise of most of the free PC companies, prices have rebounded somewhat—the average selling price of a PC this March increased to $867—but there's no question that free PCs indeed played a part in reducing costs for all computing consumers.

In an odd way, free PCs also helped stimulate high-end PC sales, says Stephen Baker, director of analysis at PC Data. With the bottom end of computing clearly defined by cheap, no-frills PCs, fast PCs are thriving amid new competition at the high end. Consumers now see value in buying a 1GHz machine with flat screen display and 8x CD-R, versus a no-frills 433MHz Celeron. A year ago, consumers were faced with the option of buying a high-end 500MHz Pentium III or low-end 400MHz Celeron—not enough of a difference to inspire buyers to shell out the extra cash.

John Latta, president of the research firm The 4th Wave, says the ultimate failure of free

CONT | 20 ▶

How Free is Free?

So-called free PC deals were so hot last summer, the Federal Trade Commission had to release a consumer alert. If you run into one of the remaining deals, consider these warnings before wading in:

- Deals may or may not come with peripherals you need, such as monitors or CD-ROMs.
- Before you buy a PC that requires you to sign up with an ISP, be sure there's a local dial-up number.
- Some low-cost deals force you to buy merchandise from the company.
- Most rebate offers require you to buy the PC up front. If you buy the PC on your credit card and it takes five months for the rebate to be issued, you'll eat it on the interest if you don't pay for the machine within a month.
- Some free deals require you to sign up for long-term service with an ISP and force you to finance the cost through the provider. This may add a hidden cost.
- Be sure the modem that comes with the free PC matches the speed of the ISP bundle. If the modem is a 56K and the ISP only offers 33.6K, you've got a problem.
- Save a copy of all correspondence with the company, including the rebate forms. If the rebate doesn't appear, file a complaint with your state's Attorney General or Better Business Bureau, or the Federal Trade Commission.
- Newbies should be aware that most free or low-cost PCs come with virtually no tech support. If there is tech support, it often requires you to dial a 900 number and pay by credit card before talking to a technician.

to the pertinent details.

HEADLINE	NEWS	DETAILS	THE SPIN	OUR TAKE
Intel Aims Low With P-IV	Intel's replacement for the Pentium III, likely to be named Pentium IV, will be aimed at the mid-range market, according to a report in the Electronic Buyers News.	The chip, codenamed Willamette, may be paired with a new single-channel Rambus memory chipset and slower bus.	Intel isn't sure the old P-III can hold its own against the new Athlons, and may relegate it to the entry-level, budget boxes.	If the reports are true, Intel will play a dangerous game. By devaluing the Willamette, Intel may cause consumers to associate the new chip with cheap-ass systems.
Office and Windows Inseparable, Gates Says	In a magazine editorial, Bill Gates defended the close relationship between Microsoft Office and Windows.	Gates writes that there is a symbiotic nature to software development that must be protected in order to help consumers.	Gates says Windows would not be where it's at without the innovations made in Office that were moved to the OS.	Sure, Bill. Does that mean it's time to integrate Office 2000 into Windows?

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Technology preview ► Operating System

Windows ME Looms Closer

Microsoft's next consumer OS offers nifty amenities, but no dire necessities

Hot on the heels of Windows 2000 is the release of the other, lesser-known OS aimed at the home consumer—Windows Millennium. Designed as an "incremental" upgrade to Windows 98 (Microsoft's words), Windows ME shares the same code base as its predecessor but adds enough new features and programs to qualify for a name change.

Rather than rehashing Microsoft's marketing spin on how it has improved "key areas" of the PC experience, let's take a look at the most obvious improvements we discovered through hands-on testing.

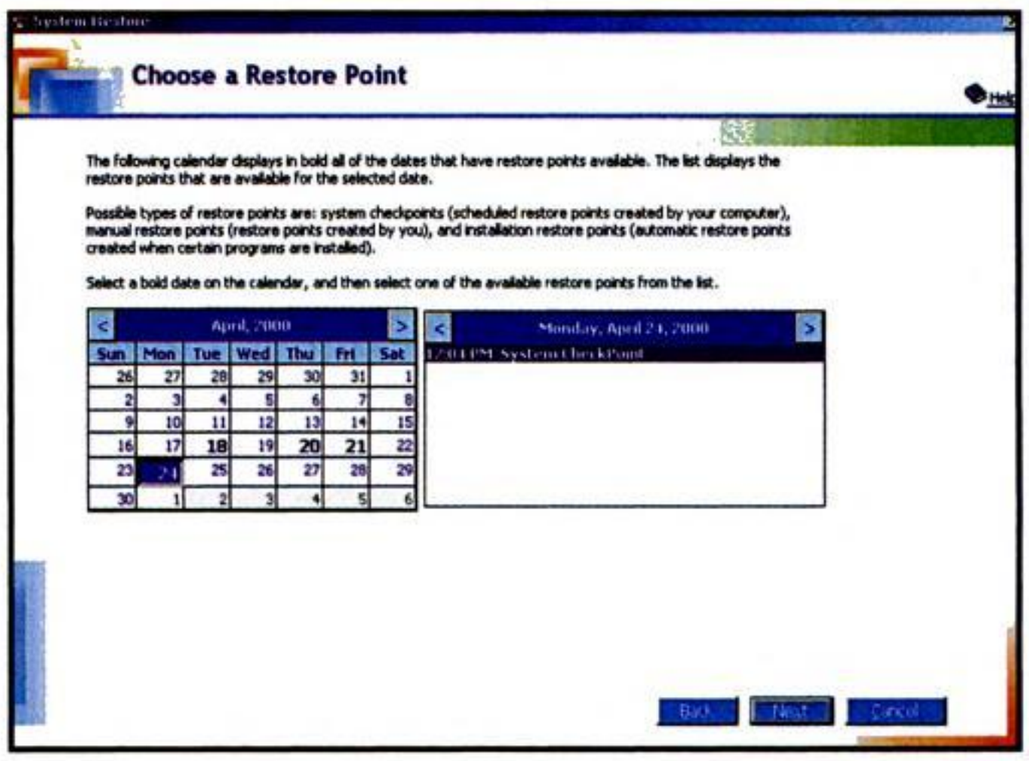
Whipped Into Shape

The most significant changes found in ME aren't in its interface, which is a spitting image of Windows 98, but in the added programs and "behind the scenes" tweaking Microsoft has done to make the OS more stable. The first thing Microsoft did to ME was put it on a diet, forcing the bloated OS to give up real-mode DOS (and Doritos, we've heard). In ME, you're not able to restart your PC in real-mode DOS, but you can still open a DOS window for some command-line actions.

Microsoft has also trimmed some lard off the boot process and implemented a system called "fast boot." Working with OEM system builders, Microsoft is targeting a 30-second boot time from system builders that adopt the program. We shaved 10 seconds in boot-up after installing Millennium, so we're pleased to report that this feature has potential.

System Health

Windows 98 has always been a very stable OS (pause for laughter), and ME continues that tradition with the introduction of several new features. The most invisible is ME's system-file protection, which prevents ham-fisted users from deleting or modifying crucial system files. Microsoft has combed through its code and identified more than 800 files that cannot be altered or relocated. If you try to delete kernel32.dll, it'll let you, but rest assured, even after emptying your recycle bin, the file will be right back in the Windows System directory where you first found it.



In the event of major data corruption, ME's System Restore utility lets you select a previous date and restore the Registry accordingly.

Another welcome addition is Windows System Restore. System Restore functions as a watered-down restoration utility, letting you crank your system back to previous dates. The function won't save everything, however, as it only restores the Registry.

Windows' help menus have also been given a shot in the arm, and are now, dare we say, useful. ME is able to incorporate third-party technical support directly into the OS, so if, for example, your Kenwood 52x drive is on the fritz, you can access Kenwood's support without ever going online or leaving your desktop. One other feature we must mention is Windows ME's ability to locate drivers for hardware. Gone are the days of inserting the disk only to be told Windows can't find the damn drivers.

Enhancements

ME comes with an entire raft of features for improved multimedia and gaming. The most obvious new addition is the nifty Windows *MovieMaker*, which is sure to upset the makers of such newbie movie-making software as *MGI VideoWave*. Import your clips into the program, drag the desired clips into a timeline, add music, narration, and even fades, hit "save," and your movie is good to go. A proprietary compression algorithm lets people backup their entire VHS collection into *MovieMaker*. You'll be able to cram about 22 hours of video into 1GB of disk space. A beefed-up Media Player adds more codecs and now lets you encode music in Microsoft's proprietary WMA format. Microsoft says WMA sounds better and occupies less space than MP3, which may be true. ME also comes with multi-player gaming support for the included board games, and realtime voice communication.

Final Thoughts

We were skeptical about whether ME offered enough new features to warrant an upgrade, but the latest version we tinkered with erased our doubts. Like the upgrade from Windows 95 to Windows 98, it's not necessary, but ME packs just enough enhancements to make it worthwhile. There's no official word on when ME will be available, but all bets are on this summer.

—Josh Norem

Cont. from pg 19

PC companies was their inability to add value to the service. Sure, cell phone companies heavily subsidize the price of the hardware, but they know that every month, customers are making calls and paying more money. Factor in voicemail, PCS paging, and microbrowsers, and the phone companies are raking in the dough. It didn't work that way for free PC companies that offered flat-fee models.

Latta predicts that the future will lie in mobile devices, such as those used to trade stocks. Even the remaining "free" deal—the rebate—may not last much longer. Latta believes that consumers don't want to be locked into one ISP for three years, even if they get a hefty rebate. In the end, free PCs were the exception, not the norm.

"It was just a fad," Latta says.

—Gordon Mah Ung

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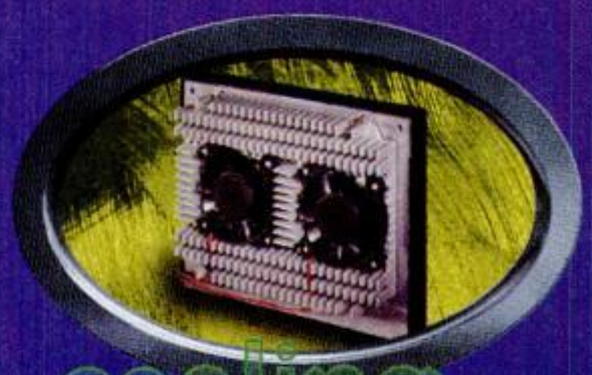

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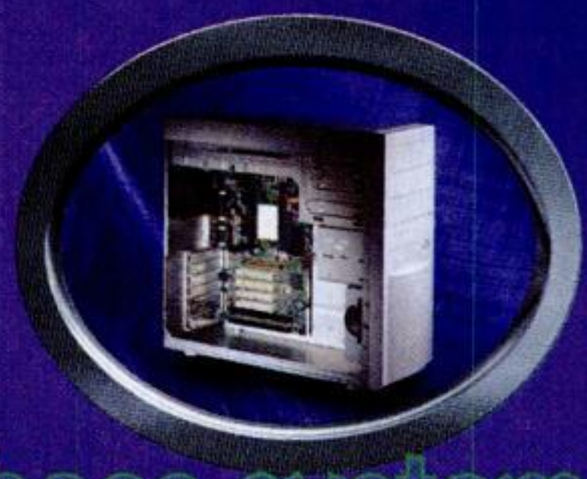

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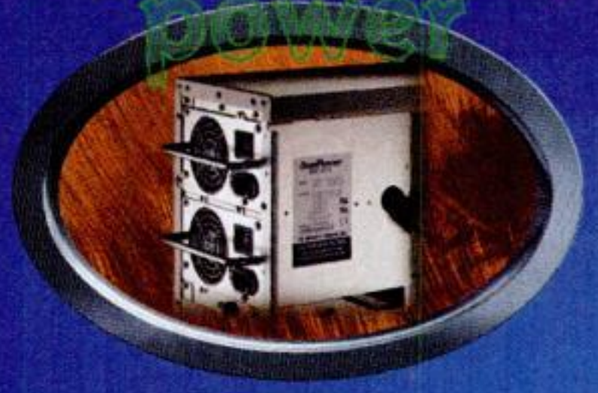

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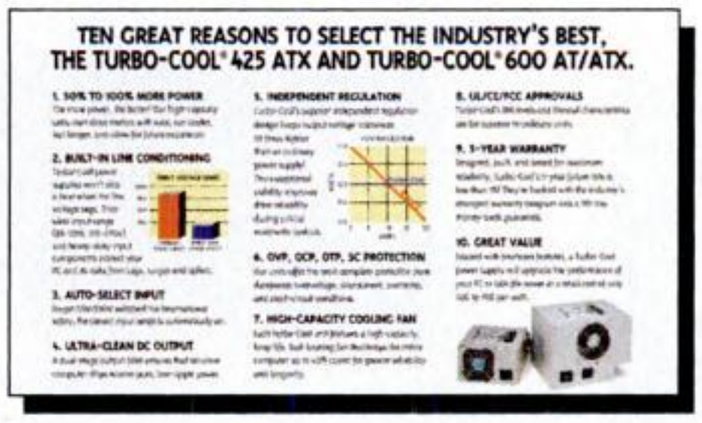

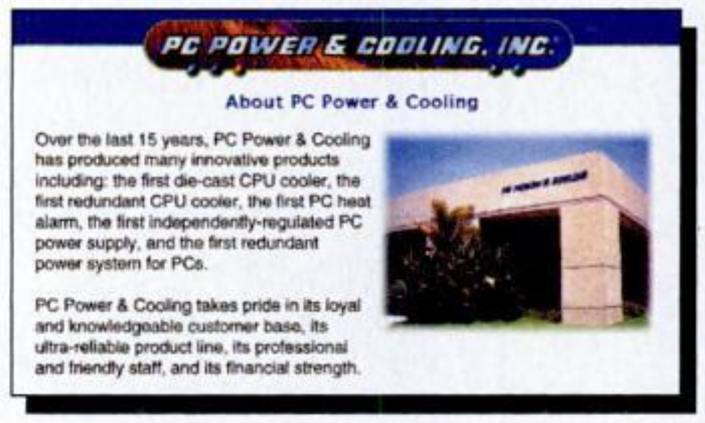

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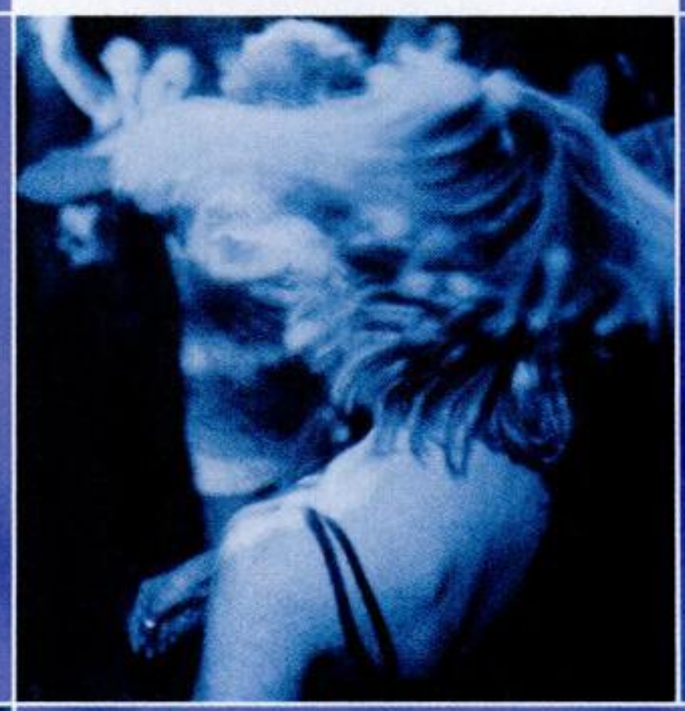

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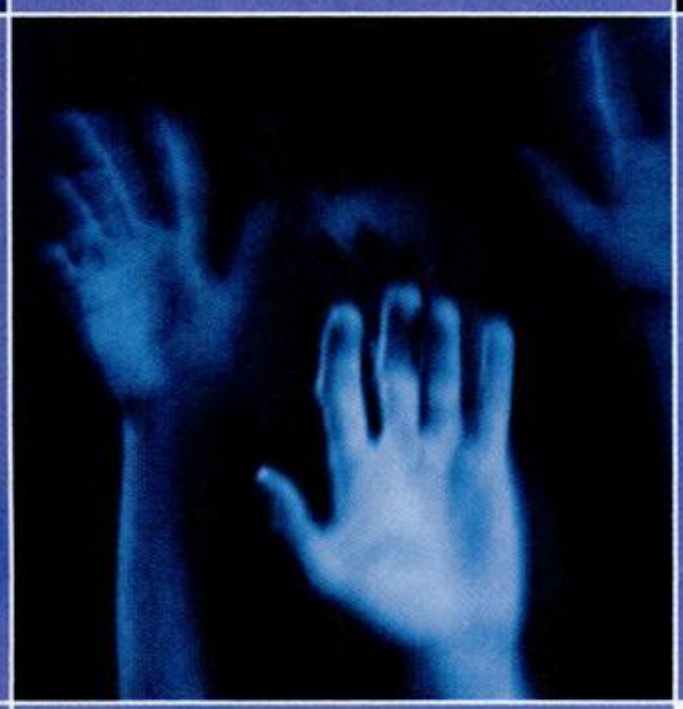

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▶ Maximum PC takes a bite out of bad service and gear

WATCHDOG

ILLUSTRATION BY SCOTT LAUMANN

Got a bone to pick with a vendor? Been spiked by a fly-by-night operation? Sic The Dog on them by writing **Watchdog @maximumpc.com**. The Dog promises to get to as many letters as possible, but only has four paws to work with.

COUNTERFEIT ATHLON ALERT

There's new evidence that chip "re-markers" have moved onto the fertile grounds of AMD's überchip, the Athlon. PC vendor ComputerNerd USA (www.computernerd.com) has issued an alert that it was slipped a tray of counterfeit and re-marked Athlons.

Re-markers crack open the case of a cheaper chip, such as a 500MHz Athlon, overclock the chip, and sell it at the higher price of a faster Athlon. They typically sand off the portion of the module that indicates its speed, and mark it at the "higher" speed.

ComputerNerd officials told **THE DOG** that, of the 100 Athlons they purchased to resell, around 30 were bogus. In most cases, consumers who purchase "OEM" CPUs won't know if they've been had; these CPUs ship in open trays without any tamper-proof retail packaging. ComputerNerd caught on to the sham because the store opens Athlon cartridges to prep them for its own overclocking kits. The counterfeit CPUs had module covers made of cheaper plastic that broke easily when removed. The fake covers also had rounded edges, as opposed to the sharp beveled edges that AMD uses. In addition, the serial numbers printed on the cases didn't match up with the serial numbers inside the modules.

Re-marking CPUs isn't a new phenomenon. Intel's Pentium II line was often the target of scam artists who made a pretty penny by selling 266MHz P-IIs as 300MHz or 333MHz chips. The problem got so bad that Intel began embedding features into P-IIIs that let consumers ID which CPU they had. Download a utility from Intel (http://support.intel.com/support/processors/ tools/ frequencyid/) and verify that your P-III is what it's purported to be.

While the ComputerNerd example is an isolated one, it should put hobbyists on the alert. Here are a few tips:

▶ Buy your Athlon from a reputable dealer or reseller.

▶ Try to buy a retail-packaged CPU. While the OEM version may save you a few bucks, it usually doesn't carry the warranty of the retail version, and re-markers generally stick to OEM or bare CPUs.

▶ Examine your CPU for signs of tampering. Does the area around the serial number and CPU speed look different in coloring? Does it look as though the cartridge was previously cracked open?

▶ If the price seems too good to be true, it probably is.

Why should you worry about it at all? For one thing, if you're going to throw down for an 800MHz Athlon, you should get what you're paying for. For another, an overclocked Athlon may or may not be stable. At this point, Athlon re-marking doesn't appear to be a widespread problem, but those hunting for CPUs should be aware of the risk when shopping.

A real AMD Athlon features sharp, beveled edges.

MINIMUS PC

DEAR DOG: I was considering ordering a new computer from Maximus PC in Monrovia, California, to replace the aging machine I have now. The machine is dependable and Maximus' support was excellent. But its web site and toll free telephone number are disconnected. Did they go under or get taken over?

—John on the East Coast

Maximus PC (no relation) is gone for good. The company filed for Chapter 7 bankruptcy on January 13 with some $1 to $10 million in debt and more than a dozen lawsuits against it for alleged breech of contract, according to federal court records. In December, one of its creditors repo'ed the company's office equipment and inventory.

It doesn't sound like you're going to miss out on much, though. At the time of its demise, Maximus PC had close to 200 complaints filed with the L.A. branch of the Better Business Bureau. Those who wish to make a claim should file form B-10 (available from your local federal court or at www.uscourts.gov/bankform/) with the United States Bankruptcy Court, Central District of California, 300 North Los Angeles Street, Los Angeles, CA 90012. The case number is 00-011124. Include your B-10 and a self-addressed, stamped envelope.

"The counterfeit CPUs had module covers made of cheaper plastic that broke easily when removed."

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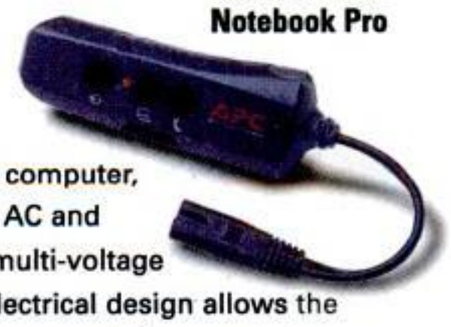

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WATCHDOG

HI-VAL GOES LO-VAL

Hi-Val, once the supplier of all things cool for the PC, has folded its tent. Late last year, Hi-Val's bank foreclosed on the outfit, according to the company that purchased Hi-Val's name.

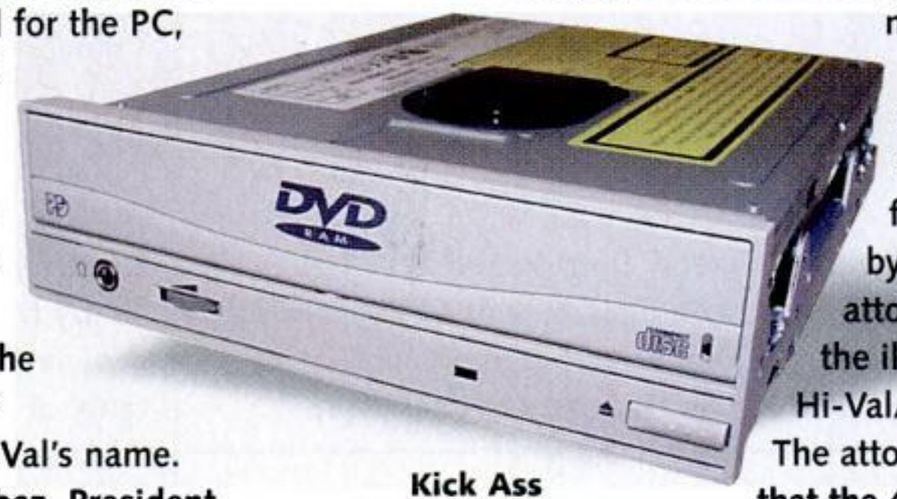
Tony Shahbaz, President of IOM Holdings, tells **THE DOG** that, during a closed auction in April of this year, IOM purchased the Hi-Val name and assets for $16.9 million.

IOM almost purchased Hi-Val in June of 1999, but the deal fell through when IOM determined Hi-Val had too much debt. Hi-Val continued to limp along until the foreclosure. That's the bad news. The good news, Shahbaz said, is that IOM didn't buy Hi-Val with the intention of putting it to sleep. IOM has obtained $25 million in credit for the new Hi-Val.

"We're committed to turning [Hi-Val] around. We're going to have better service, better products, and better support."

"We're committed to turning it around," Shahbaz says. "We're going to have better service, better products, and better support."

Meanwhile, those saddled with bad Hi-Val rebates may be out of luck. IOM purchased Hi-Val's assets, not its liabilities. Development Specialists, Inc. is notifying the staggering number of creditors and customers left hanging by Hi-Val's default. DSI estimates some 63,000 people are owed money by Hi-Val—most are those whose rebates were never fulfilled. (**THE DOG** notes that the publishing company behind *Maximum PC*, Imagine Media, is also owed a chunk of change.) Claim forms were mailed directly to customers; those who didn't receive a form should contact DSI at 213.617.2717, or write Development Specialists, Inc. at 333 South Grand Ave. Suite 2010, Los Angeles, CA 90071, to obtain a claim form. Consumers have until October to file claims. The chances of a payoff are slim, but you never know.



Kick Ass products didn't keep Hi-Val from shutting down.

Hi-Val's status doesn't affect a suit filed against it by a Philadelphia attorney regarding the ill-fated 40x40 Hi-Val/Kenwood drive. The attorney alleges that the 40x40 is a faulty product and is seeking relief for consumers who purchased the drive. Attorney Jonathan Shub says the suit is still pending against Kenwood and Hi-Val. Watch this space for updates.

AUREAL DEAF?

There's unstable ground developing under Aureal, creator of the popular Vortex series of soundcards. Aureal's executive team and top officers resigned en masse in early April. A week later, the company filed for Chapter 11 protection from creditors under the bankruptcy laws. However, an Aureal spokeswoman said the company is still in business and will continue to offer driver and tech support for its products.

BUY.COM'S CREATIVE CALENDAR

THE DOG can't help but point out this interesting e-mail that reader Jason Stucky says he received from Buy.com: "Our friendly customer care agents are available 7 days a week, 365 days a year, toll-free at 1.888.880.1030. Please call between 9AM-4PM Monday-Friday so that we may advise you as to the steps required to rectify this situation." Huh? What calendar is Buy.com using? (To be fair, the company does offer 24/7 support at its 800 number.)

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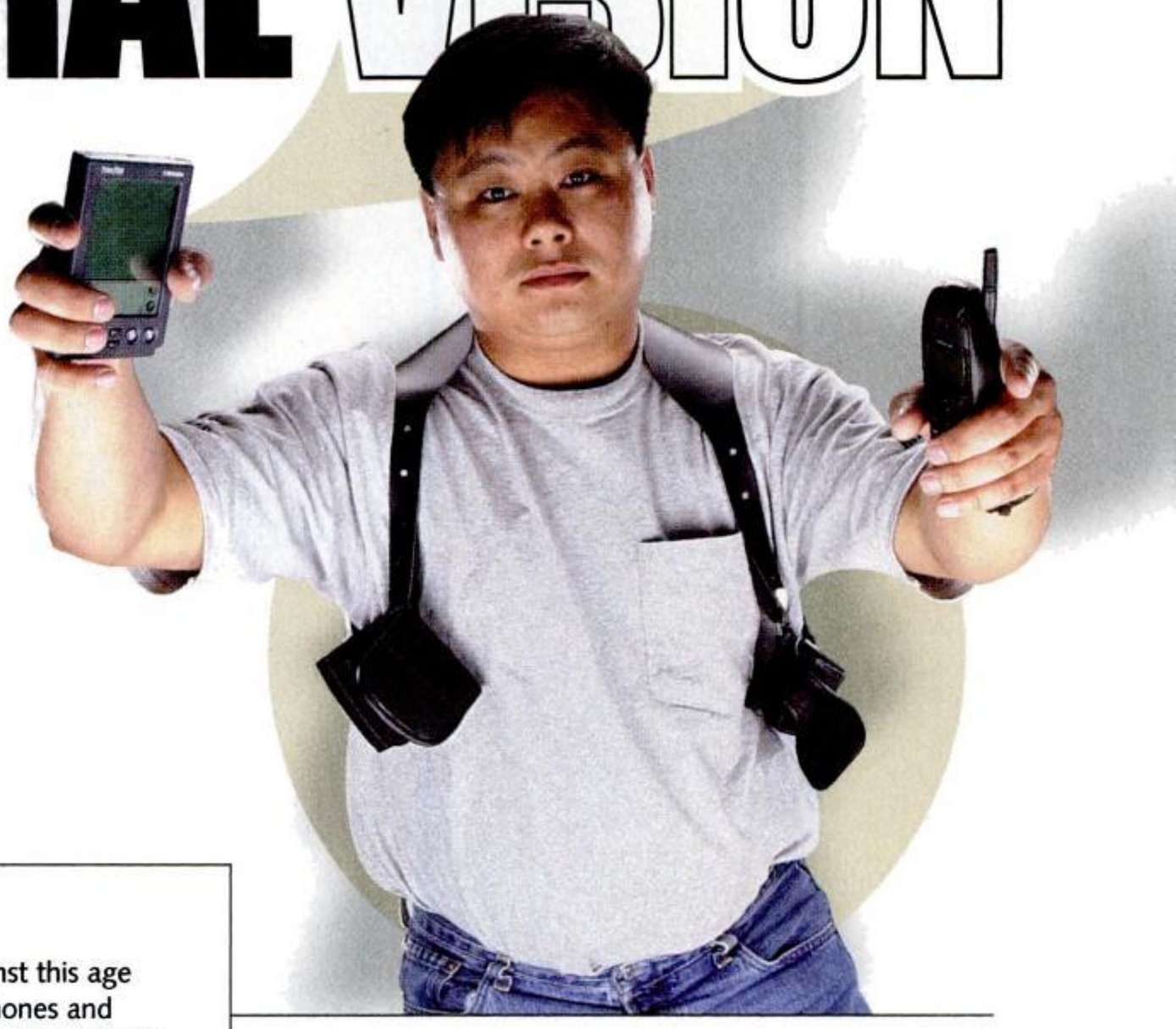

E-Holster

Always wanted to be a gumshoe? E-Holster's shoulder rig **(www.eholster.com)** comfortably holds a PDA and cell phone—perfect for undercover assignments. The maker consulted with famed holster designers Jerry Ahern and Gene Desantis to come up with this spitting image of Galco International's popular "Jack Ass" holster. Available in leather or neoprene, the E-Holster is made to accommodate additional snap-on modules for holding such extras as a small clamshell computer, an Apple Newton, or sunglasses. Gordon says the only thing that could make the E-Holster better is a place to put his soft drink.

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We've all met people who are waging their own personal war against this age of superconnectivity, those who have pledged to dump their cell phones and notebook computers, rendering themselves unreachable and "free" when they're away from the office...aren't they terrible misanthropes? The PocketMail BackFlip **(www.pocketmail.com)** is yet another way of ensuring that you're always in touch—it's a wireless modem that snaps onto the bottom of your Palm. Install the included PocketMail e-mailing and faxing software (both are compatible with the contact info already stored on your Palm), and staying connected is as simple as dialing PocketMail's toll-free number from any phone and holding the unit up to the receiver. We sent five e-mails and a fax, and received one message, all in about 45 seconds. The PocketMail service costs $9.95 per month for unlimited e-mail access; faxes are 25 cents apiece. That's a small price to pay, really, to avoid being labeled anti-social.

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▶ TOMORROW'S TECHNOLOGIES EXPLAINED

FAST FORWARD

The X-Box Factor

WHY PCS AREN'T ENOUGH FOR REAL GAMERS

Like a *Quake III* newbie about to get smoked by his first enemy with a plasma gun, some PC users were caught off-guard when Microsoft announced the X-Box. Why is a software company making a videogame console? Is the X-Box really just a PC in disguise? Which platform does Microsoft see as the future of electronic gaming—the PC or the game machine? Whose side is Microsoft on, anyway?

Microsoft is making the X-Box because times have changed. There was a time when a leading software publisher would have trashed its reputation in the business community by making a videogame machine, or even by making games *for* a videogame machine. Not many years ago, critics dissed the first multimedia computers as toys because of their superior color graphics and sound—real computers had green monochrome screens and ran spreadsheet software. Early game machines such as the Atari 2600 were snubbed as lowly imitations of computers, and they were soon blasted into oblivion by home PCs.

Nobody makes fun of games anymore. Last year, videogame sales reached $3.5 billion and computer-game sales totaled $1.3 billion. Those numbers alone should explain why Microsoft is making a big play in the console market. If you want to grow a software business, games are a potentially winning strategy. Avid gamers buy several games a year, but not many PC users buy more than one operating system, word processor, or spreadsheet program each year.

Some gnats say there's no room for another console because Sony, Nintendo, and Sega already have the market locked up, or because PCs make better game platforms. But they said the same thing when Sony was the newcomer, chasing after Nintendo and Sega. Come to think of it, they said the same thing when Nintendo and Sega were the newcomers, chasing after Atari.

There's room for Microsoft because the game market is still rapidly expanding, and because modern game consoles are powerful enough to handle some popular nongame tasks that are usually performed by PCs. Console performance is climbing as a step function. Let me explain.

Microsoft views the X-Box as an additional platform, not as a replacement for PCs. Microsoft simply wants to build a bigger ranch that has racehorses, too.

Because consoles are designed primarily for playing games on a TV set, they can often outperform PCs' frame rate performance—when they're new. The problem is that consoles aren't upgradable, so PCs soon surpass their performance. But that doesn't last long, either. Pretty soon, another company introduces another hot new console, and it surpasses the PCs for awhile. This game of leapfrog may continue indefinitely.

Of course, to stay ahead of PCs, the most dedicated gamers must buy new consoles every year or two. But guess what? The consoles cost less than frequent PC upgrades would cost. And consoles are hitting the market on a staggered schedule, a year or two apart, so the latest model takes advantage of the latest technology. (That's the step function.)

TOM HALFHILL
was senior editor at *Byte* magazine and is regarded as one of the most knowledgeable experts on processor technology in the industry. Contact him at **thalfhill@maximumpc.com.**

Consider the X-Box. It's not a stripped-down PC, and even though it will use some familiar PC components, it won't be compatible with PCs. The X-Box will have a 600MHz Pentium III, a custom-designed 300MHz nVidia graphics coprocessor, 64MB of main memory (200MHz, 128-bit, DDR SDRAM), an 8GB hard drive, a 4x DVD-ROM drive, USB, and Ethernet. It's more powerful than most of today's desktop PCs (and more powerful than Sony's Play Station 2). It will do anything Microsoft wants it to do.

More to the point, the X-Box won't do anything Microsoft *doesn't* want it to do. Unlike PCs, the X-Box is a closed, proprietary platform that's completely controlled by Microsoft. It will carry the Microsoft brand name and require a special operating system based *on* Windows but not compatible *with* Windows. Security lockouts will limit software development to authorized companies—and those companies must pay royalties to Microsoft for the privilege. Sony, Nintendo, and Sega each have a similar business model. It's very profitable.

So Microsoft views the X-Box as an additional platform, not as a replacement for PCs. Microsoft simply wants to build a bigger ranch that has racehorses, too. And Microsoft knows that the real cowboys will want both. ✹

Random Thoughts

▶ It's true that the latest Intel Celerons are actually Pentium III chips with half of the on-chip L2 cache disabled at the factory. The Coppermine Pentium III has 256K of L2 cache, while the Coppermine Celeron has 128K. Intel had to do something to preserve a luxury market for the more expensive Pentium III. Ten years ago, Intel pulled the same trick by disabling the FPU on 486DX chips, and selling the crippled parts as the 486SX.

▶ Backers of the new USB 2.0 standard, a much faster version of today's USB interface, are still aiming to debut the first products this fall. But operating-system support from Microsoft might not happen that soon, so 2001 is a more realistic target. USB 2.0 is 40x faster than USB 1.0.

▶ Don't follow this link, **www.soda.co.uk/soda/constructor/**, unless you've got lots of time to kill: It's a clever Java applet that lets you design and animate your own wire-frame models.

For definitions of Terminator words, hyperlink to the back of Maximum PC, or check out the Terminator online at www.maximumpc.com.

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Actual game footage

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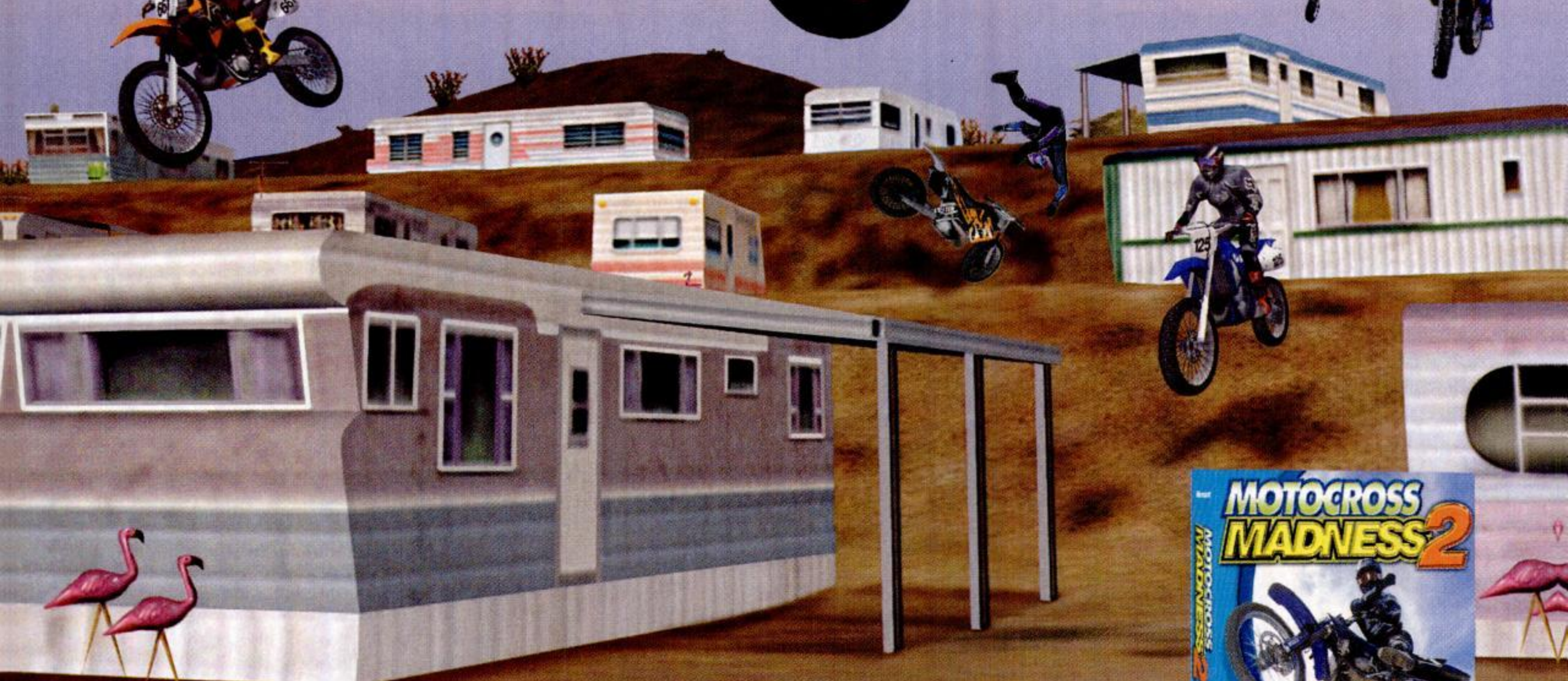

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▶THE SCOOP FROM A MAJOR PLAYER

GAME THEORY

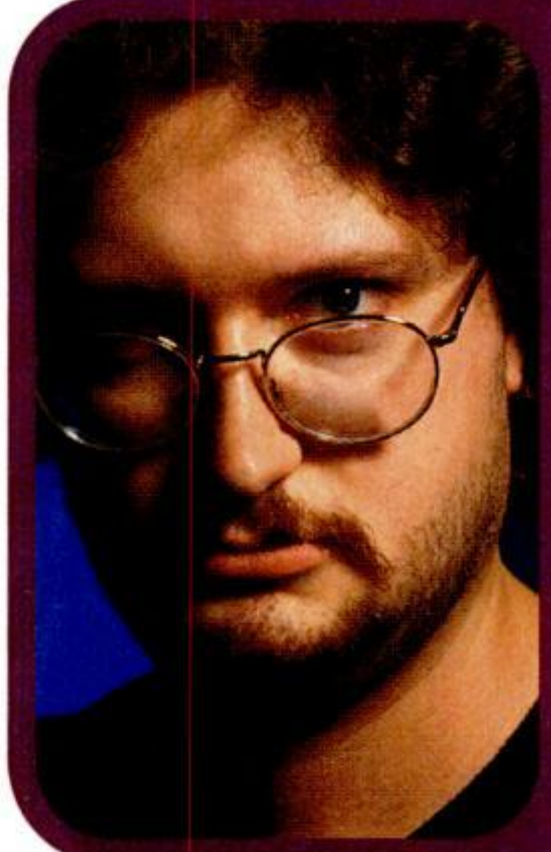
To everything there is a season, including games. The nascent space-combat genre is experiencing a surge after a relative fallow period during which we saw *Freespace 2* and not much else. Odd that computer gaming, dominated for so long by the likes of *Wing Commander* and *X-Wing/TIE Fighter*, should see a stretch with so few titles, good or bad, in such a popular genre. But recently, we've seen *X: Beyond the Frontier; Tachyon: The Fringe; StarLancer; Allegiance;* and soon, we're told, *FreeLancer*.

Space combat sims almost always follow the example of the *Star Wars* films by essentially setting Earth-based aerial dogfighting in outer space. They make little effort to capture the peculiar physics and gravitational limitations that would characterize actual ship-to-ship fighting in the noiseless, airless vacuum of space. (The way combat is handled on the *Babylon 5* TV show is fairly close to the mark, with ships turning on an axis while continuing their flight path.) The only game I can recall that used a true space-combat physics model was an old MicroPlay title called *Mantis.* Though *Mantis* was spectacularly un-fun, it seems that such a novel approach would inject new life into a genre that, despite impressive production values and totally acceptable designs, has gone flaccid.

In fact, *StarLancer* is a perfect example of why space-combat sims trickled off. It's a wonderfully slick game with everything you've grown to expect from the genre, but little more. Digital Anvil clearly sees *StarLancer* as the bastard half-brother of Chris Roberts' massive *FreeLancer*. Foisted off on designer Erin Roberts and developer Warhog—the team responsible for the ho-hum *Privateer 2*—*StarLancer* is a strong, stable game. There's simply nothing jolting or novel about it. We've played this game before, and no matter how good it looks, there's still an inescapable sense of déjà vu.

Not so with *Tachyon: The Fringe*, a game from which I expected little, and ended up pleasantly surprised. *Tachyon* follows a familiar pattern: outfit ship, fly to a point, fight, fly to another point, fight again, land, collect money, repeat. But it has more character than *StarLancer*, from its dirty ships and interesting setup to a voice performance by Bruce Campbell that goes a long way toward establishing the tone and character of the game. NovaLogic also took some time to add a few interesting control twists. The slide function enables you to continue on your current trajectory while you turn your ship on an axis, á la *Babylon 5*. It's not a true space-physics model, but it approximates the feel and creates some unique tactics when combined with rapid-reverse thrusters. *Tachyon* doesn't have all the polish of *StarLancer*, but it has more soul.

Putting them both to shame is the incredibly innovative *Allegiance*. This is a fiendishly complex game, full of arcane controls and strategies. It takes the first-person combat/third-person tactical gameplay elements of *Heavy Gear 2* and *Battlezone*, plops them into space, expands them to gargantuan proportions, and wraps them in a massive multiplayer game architecture. The results are stunning. The combat portions are totally attractive and fast-paced, but the tactical elements are what make *Allegiance* stand out. Players cooperate to achieve tactical goals under the guidance of a commander, with another player managing supply and investment. The result is a highly customizable, stable, complex, and vast online space-combat game with tactical nuance. This must be what Origin has in mind for its upcoming multiplayer *Wing Commander* game, but *Allegiance* has beat Origin to the market.



T. LIAM MCDONALD
is a veteran gamer and game writer. His reviews appear regularly in *PC Gamer* and other publications. Write him at **tmcdonald@maximumpc.com.**

StarLancer gave us the familiar and slick, *Tachyon* gave us character and some interesting control mechanics, but *Allegiance* moves the genre into new territory, which is where PC gaming needs to go if it plans to survive the console onslaught. Dreamcast could never do this. ✹

Space-Combat Goes to War

AN ARMADA OF NEW TITLES SHOOTS LIFE INTO A FLAGGING GENRE

Allegiance moves the genre into new territory, which is where PC gaming needs to go if it plans to survive the console onslaught.

Random Thoughts

▶ Well, well, well... The *Daikatana* demo landed on my desk with a plop and proceeded to stink up my entire office. I know that the press has been sharpening knives for this game for reasons wholly unrelated to its particulars, thus giving Ion Storm and John Romero plenty of cause to say we're out to get 'em. But I did my utmost to remain objective as I downloaded, installed, and started *Daikatana*. I really hoped it would be good; I have no investment in seeing Ion Storm fail. But it has failed, and failed hugely and expensively. From the initial seconds of the game, where you're greeted by hideous, green-glowing water, and mosquitoes and frogs attacking you above and below your line of sight, you're in gaming hell. It's just ugly. The enemies are incomprehensible. The levels are pat and predictable. The weapons are out of the FPS Game-O-Matic. Multiplayer simply didn't work. It is flat-out not fun. I looked and looked for signs of the hundreds of man hours, thousands of lines of print, and millions of dollars that have been dedicated to this game, and saw only a 3D-accelerated version of *Island Peril*.

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ULTIMATE UPGRADE BIBLE

Thou shalt covet hardware upgrades that grants your PC a long and prosperous life

Maximum PC readers, do not ignore the signs that your PC is on a dangerous path to obsolescence: Your venerable hard drive has grown slow and feeble, your videocard cowers in the face of the latest games, and your CPU cannot contend with the 1GHz monsters that your neighbors have acquired. You are the power users, the PC elite, the Chosen People—and the time of reckoning is upon you. Thou shalt covet thy neighbor's superior hardware!

There's no need to scrap your current machine for a brand-new PC, when replacing a few of your key components can make all the performance difference in the world. For instance, you may have a videocard that pushes more geometry than a high-school textbook, but you won't realize its full potential until your hard drive spins fast enough to keep your system fed. Keep in mind that your PC is only as fast as its slowest bottleneck, so don't overlook less glamorous components in your quest to have the fastest clock on the block.

On the other hand, don't get carried away—the idea is to choose your upgrades *wisely*, not necessarily to replace every piece you can get your hands on. Sometimes, the latest and greatest hardware doesn't make the best upgrade. You can ante up a king's ransom for a gigahertz CPU, but you may be better off finding a reasonably priced 800MHz processor and sinking your savings into a fat soundcard and CD-RW drive.

Consider what *you* do with your PC—then decide whether more memory, a new CPU, or a new hard drive will help you do it better. There's something to be said for buying ahead of the curve and growing into the capabilities of state-of-the-art hardware, but paying for advanced features that you can't or don't take advantage of is a foolish choice.

Our Ultimate Upgrade Bible will guide you in your search for the component upgrades that will make the largest impact on your PC. It will help you decide how long to hang on to your current parts, and when to replace them—and whether you should replace them with components that are available right now or wait for the next big thing.

Thou shalt not accept inferior hardware. Thou shalt turn your aging rig into a fast, furious system that is worthy of you. Go forth and multiply!

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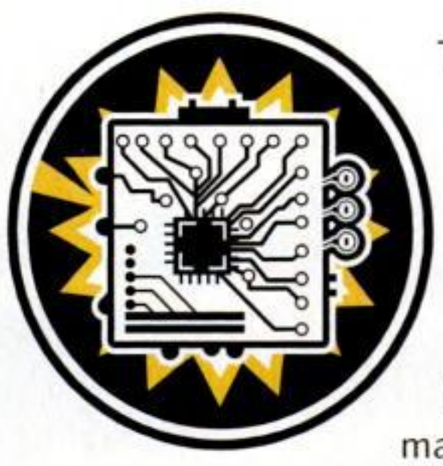
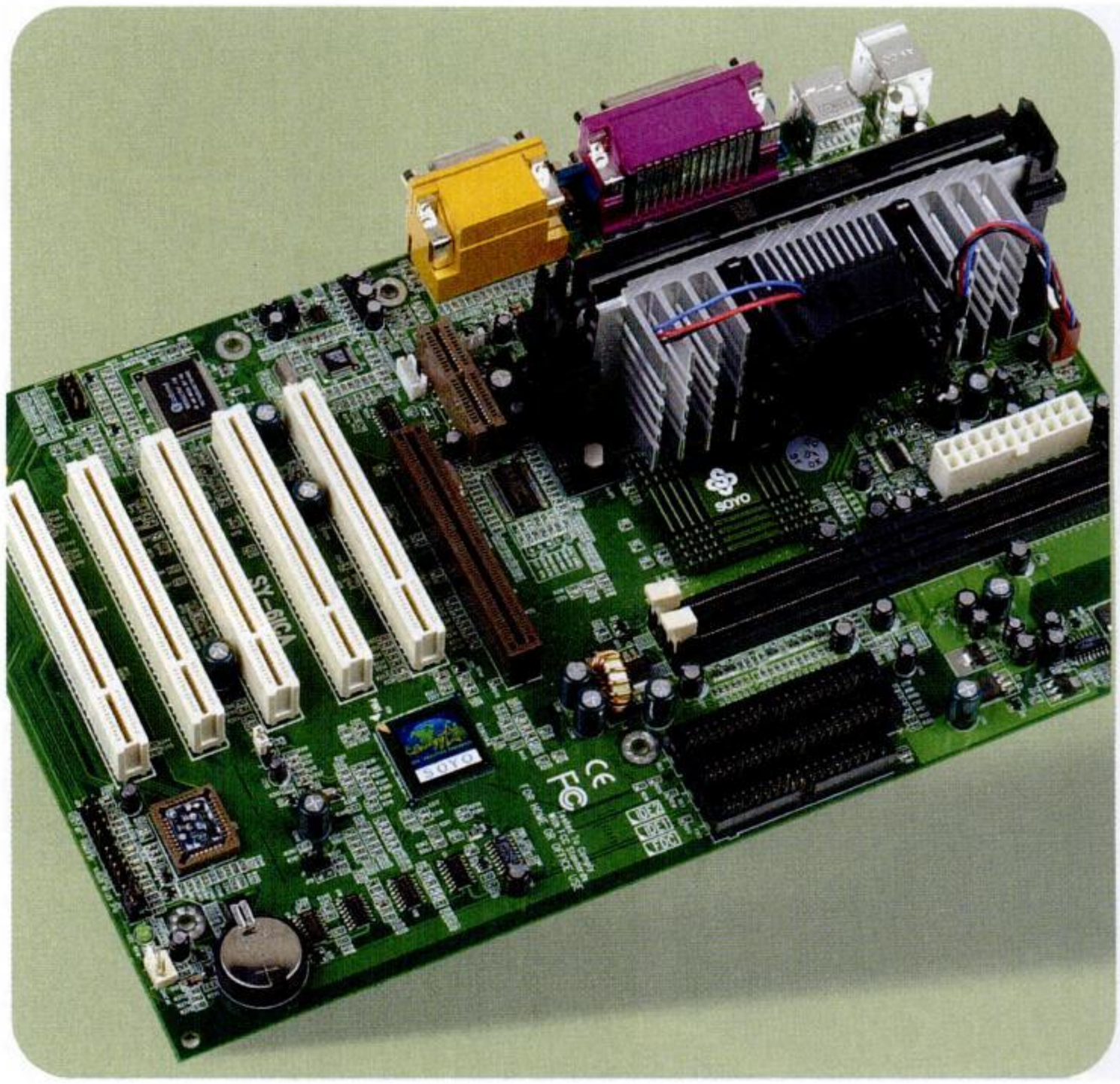
CPU and MOTHERBOARD



These days, swapping out a CPU is akin to shoving a 440-cubic-inch engine into a Volkswagen Beetle. It's no longer just a matter of upgrading the CPU—now, there's the question of whether all the surrounding components will need to be replaced as well. A new CPU will most likely require a new motherboard, which in turn will require different RAM, and maybe even a different case. Then there's the new hard drive and videocard you'll want to buy, in order to take full advantage of the advanced features supported by the new motherboard chipset. And since so much depends on the CPU and chipset, choosing the right motherboard and processor combo is the most crucial upgrading decision you'll face.



MEMORY

If you think upgrading to a faster CPU or videocard will net you the most speed, think again. In most cases, adding a few megabytes of RAM is more effective than installing a shiny new CPU. How much is enough? You're seriously running on empty if you're trying to push that fat Redmond OS around with 32MB or 64MB. In fact, let us know if you still have 32MB, and we'll transfer your subscription to something more your speed—like *Your Grandma's PC* magazine. For general use, we recommend 128MB in Win98—after that, you'll hit diminishing returns. Windows NT/2000 users should consider a minimum of 256MB; the added headroom makes editing large *Photoshop* files a pleasure, and keeps Windows from beating your hard drive to death as it caches applications to virtual memory.

The big question, of course, is which memory should you buy. If you're running a PC100 SDRAM box, your purchase should be PC133 SDRAM—there's really no reason to buy PC100 when the price of PC133 is virtually the same. However, PC133 SDRAM may have a limited life span. Intel's continuing push of Direct RDRAM almost guarantees that it will become somewhat of a standard. In fact, Intel's replacement for the Pentium III will actually mandate the use of Direct RDRAM.

A dark horse you should be aware of is DDR SDRAM. Double Data Rate SDRAM may emerge this year as a serious threat to Direct RDRAM—big names such as Micron, Hyundai, and Infineon are behind it, as are AMD, VIA, and a gaggle of folks who don't want to pay royalties to Rambus. It isn't clear who will win the battle, but it's almost certain that both both RDRAM and DDR SDRAM will sink the value of PC133 SDRAM within about 12 months, so don't stock up on it.

If you were smart enough to buy a 440BX-based motherboard when you built your 266MHz machine in 1998, you could be in luck when it comes time to upgrade—if the mobo supports the Coppermine's lower voltage requirements, it can theoretically run a 1GHz CPU. Intel's newer Coppermine Pentium IIIs (700MHz and faster) require lower voltage settings. If your motherboard can't support these lower voltages, you should at least be able to run a 600MHz Pentium III in your BX mobo. Visit your motherboard manufacturer's web site for the full skinny.

If you're running an 800MHz Pentium III and an Intel 820 motherboard, you won't have to sweat upgrading anytime soon. You will, however, have to sweat buying expensive RDRAM.

The vagaries governing which CPU you can use with your chipset and motherboard are as complex as the tax code. Intel's Pentium II and III processors mate well with the 440BX or 820 chipsets, while Celerons are better suited to the 810, 440ZX, and 440LX chipsets. Combine a Pentium II with a 440LX motherboard and you'll top out at 333MHz—put a Celeron into that same mobo and you can cruise at 500MHz. Again, check your motherboard manual to find out what it supports.

If you waded into the murky Athlon waters with an early 550MHz Athy, you're in good shape; almost every Athlon AMD750-based motherboard appears to support up to 1GHz CPUs, in both their current form and their next iteration, codenamed Thunderbird. Getting a Slot A Thunderbird may pose a serious problem, however, since AMD will only sell the Slot A CPUs to system OEMs. Boxed Thunderbird

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processors will only be available in AMD's new-fangled connector dubbed the Socket A. Of course, the really bad news, if you haven't heard it yet, is that VIA's hot new chipset, the KX133, is simply incompatible with Thunderbird. Doh! If you were one of the early adopters of that chipset, you're out of luck when it comes time to board the T-bird express.

What's the minimum-speed CPU you should buy? 1GHz. Too rich for your blood? We recommend at least 800MHz for all new machine purchases. That might sound high, but in our opinion, buying the most powerful components you can afford protects your investment in the long term. After all, if you purchased a 266MHz Pentium II two years ago instead of a 400MHz Pentium II, you saved $600 back then, but you now own a worthless proc. The 400MHz system is still serviceable. It goes without saying that you should avoid core-logic chipsets and bus speeds that are clearly on the way out, but we'll say it anyway.

If you're looking for a motherboard that'll carry your PC into the future, Yoda can't say—set, the future is not. We're betting that Intel's new 815 and 820 chipsets are worth waiting for. And Intel's Pentium IV will supercede every other Pentium on the market today. As for AMD, its new 760 and 770 chipsets threaten to make all current Athlon chipsets look like chumps.

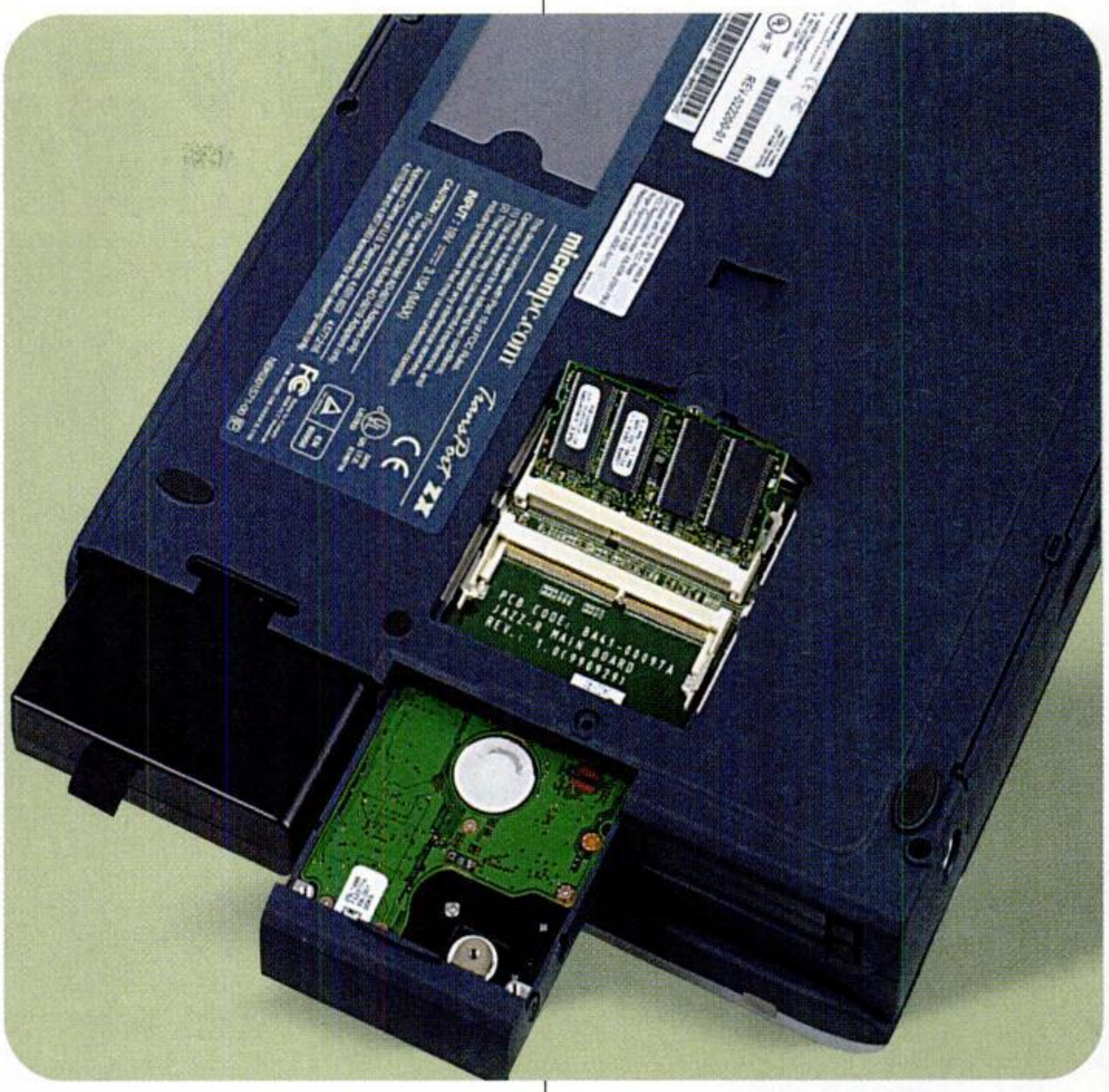
If you must make a mobo purchase, we recommend Intel's 820 chipset or VIA's Apollo Pro 133A for Pentium-based PCs. For Athlons, look to VIA Technologies' KZ133, the successor to VIA's screwed-up KX133. It's free of the bugs that plagued the old chipset and works with the faster Thunderbird CPUs. (For more on mobo chipsets, see the White Paper on page 69.)

CPU UPGRADES

IF YOU HAVE...	UPGRADE TO...
166MHz Pentium/ 233MHz K6-2/266 MHz P-III	800+MHz Pentium or Athlon CPU.
Intel Pentium III 500MHz	Wait for Intel's Willamette or AMD Thunderbird before making a jump.
AMD Athlon 700MHz	You have a state-of-the-art CPU architecture. Look to improve speed at other bottlenecks, such as the hard drive, videocard and RAM.

MOTHERBOARD CHIPSET UPGRADES

IF YOU HAVE...	UPGRADE TO...
Socket 7 or 440LX mobo	KZ133/i820/Apollo Pro. a 133A-based board.
440BX	Don't retire this workhorse if it can support Coppermine voltages.



NOTEBOOK

Nothing saddens us more than a notebook with an ultra-fast processor, but with inadequate RAM and an itty-bitty hard drive. If you find yourself with such a book, go out and get the biggest hard drive and most memory you can afford.

We have good news and better news. The good news is that if you bought a notebook within the last six months, you have a machine that can rival most desktops, so you won't need to upgrade anytime soon. The better news is that if you're chugging along on an old clunker, you can upgrade certain key parts. But we have to draw the line at a P-II 200. If you have anything slower, no amount of upgrading around the notebook's circumference is going to make a difference—it's time for a new book, bub.

Unless you've got a soldering iron and a blatant disregard for the value of your hardware, you can't swap out your notebook's proc, mobo, or LCD screen. But here's the scoop on what you can do.

Achieve the easiest and most instantly gratifying notebook upgrade by adding more RAM. Most notebooks have two DIMM slots, allowing for 4MB, 128MB, 256MB, and 512MB configurations. Check with your notebook manufacturer to ensure your machine is compatible with larger RAM amounts, then crank your book up to at least 128MB. Basic 32MB modules go for $100 apiece, or less. 256MB modules are available, but they can run between $350 and $450 apiece. Besides, the only reason to run that much RAM on your notebook is if you're doing 3D modeling, or planning to overthrow a small country.

Once you've bumped up your RAM, take a crack at the hard drive. Most hard drives are sold in 6GB, 12GB, and 18GB configurations that range (roughly) from

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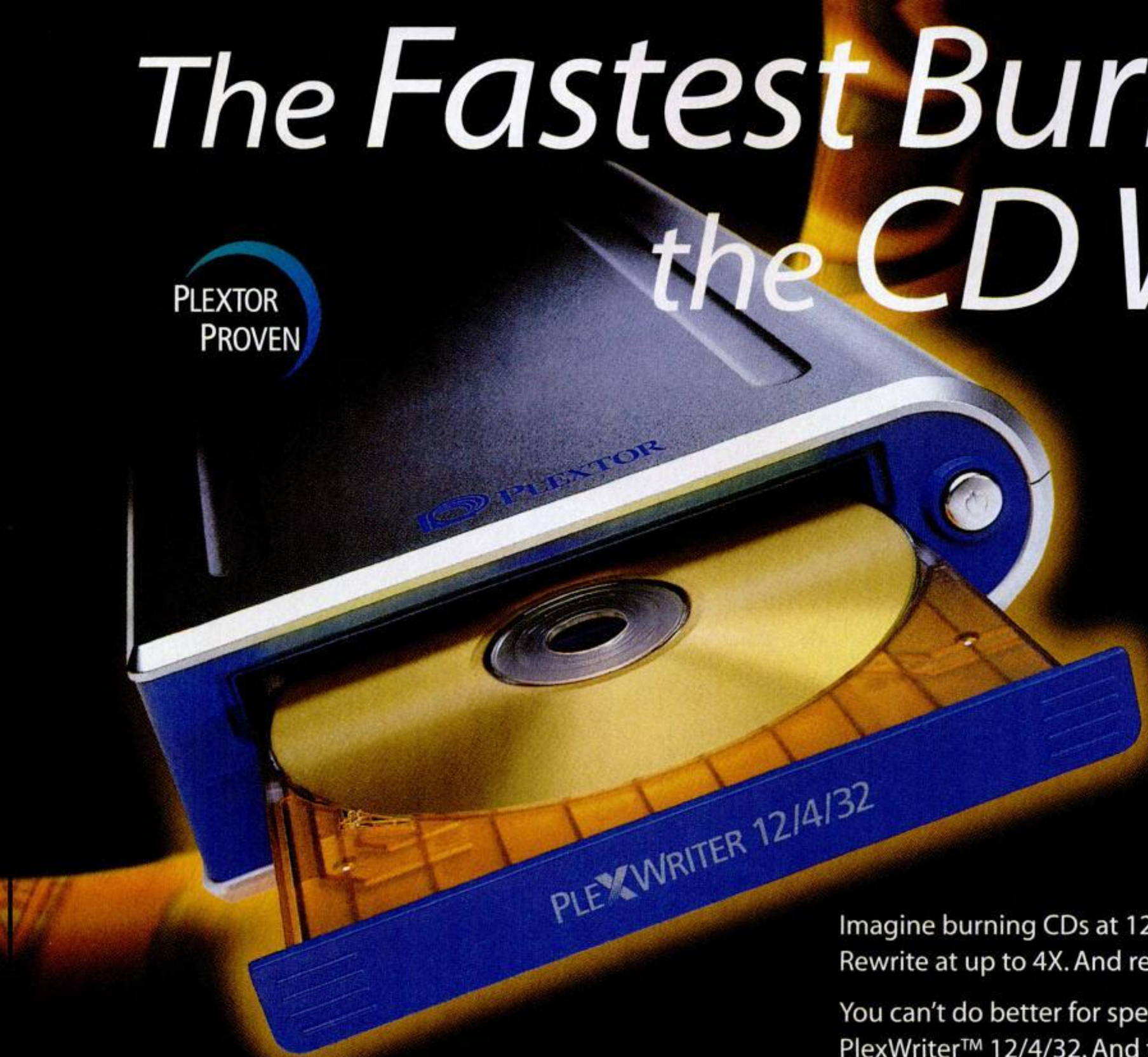

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$300 to $550. There's no reason to hang on to your old 1GB hard drive when you can buy yourself some breathing room for a few hundred sheckels. Again, check with your notebook and hard drive manufacturers about compatibility issues.

For those ready to get behind the wheel of a new notebook altogether, options are plentiful. A sure sign that the notebook scene is heating up fast is Toshiba's recent announcement that it will use water-cooled processors in its new line of notebooks. Even if it means dumping coolant into your system once a week, don't accept less than a Pentium III 500MHz proc—P-IIs and Celerons need not apply. Your next notebook should have at least a 12GB hard drive, 128MB of RAM (preferably in one slot, so you have room to upgrade), a DVD-ROM drive or a CD-RW, and an ATI Rage Mobility video chipset with no less than 8MB of video memory. And, as always, be on the lookout for the latest and greatest—accept nothing less than AGP 2x 3D acceleration and a variable-speed CPU. The standard cash drop on a new notebook is four grand, so go with something you know you'll still use in a year.

A variety of new notebook technologies make purchasing a new machine worth considering. Intel's Speed Step-equipped notebooks run at 700, 650, or 600MHz when plugged in, and 550 or 500MHz when running on battery power. AMD has similar plans for its mobile Athlons, which should arrive later this year. And innovations on the video front are finally bringing decent 3D to notebooks. Currently, the two prime contenders are S3's Savage MX and ATI's forthcoming Rage Mobility 128 chipset, but this fall, you can expect more serious mobile 3D firepower to arrive from nVidia.

NOTEBOOK UPGRADES

IF YOU HAVE...	UPGRADE TO...
64MB or less of RAM	At least 128MB
6GB or smaller hard drive	At least an 18GB hard drive
No drive other than a Floppy	An internal CD-ROM (or CD-R) drive.

NOTEBOOK REPLACEMENTS

IF YOU HAVE...	UPGRADE TO...
P-II 233, with 64MB, 6GB, and a floppy only	P-II 400, with 128MB, 8GB HD, and CD-ROM
P-II 400, with 128MB, 8GB, and a CD-ROM	P-III 500/550, with 128MB, 12GB, and a DVD
P-III 500, with 128MB, 12GB, and a DVD	P-III 700, with 256MB, 18GB, and a CD-RW

If you can muster the dough, the 21-inch Sony F500 is the best display you can put in front of your eyes. It boasts ultra-high refresh rates, true 0.22 stripe pitch, and a flat-as-a-pancake screen.

MONITOR

Unless you just gaffled Regis for his untold millions, your monitor purchase will be the most sensitive upgrading decision you make. Because good monitors are extremely expensive compared to other parts, most people upgrade them just once every three or four years. If you fall into this category, buy the best monitor possible when you finally do take the plunge, and don't avoid better, more expensive displays out of sheer stinginess. You'll be living with your monitor long after you've junked your other parts.

All CRT monitors are based on one of two technologies: shadow mask or aperture grille. Shadow mask monitors run cheaper, but tend to offer darker screens and less vibrant colors than their aperture grille cousins. The reason is simple: Shadow mask monitors filter out a greater number of electrons than do aperture grille monitors, and therefore allow less light to reach your eyes. Shadow mask monitors can also suffer from screen purity problems that give their displays a mottled, smudgy look.

By now, you can guess where we're going with this—we're fools for aperture grille displays! Besides looking more spectacular, AG monitors also tend to fill out the high end of each manufacturer's product line, and therefore boast better resolution, refresh rate, and pitch specs. Currently, aperture grille tubes are only manufactured by Sony and Mitsubishi,

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so if you find an AG monitor being sold by another company, you can rest assured that the company purchased the basic tube assembly from either Sony or Mitsubishi, then slapped on support circuitry and a plastic chassis and called it a day.

Brightness and color vibrancy aside, most *Maximum PC* editors would still prefer a 21-inch shadow mask display over a 17-inch AG display. Bigger is better, and we don't want to hear a single peep from folks who say they're sticking with their 17-inchers because larger monitors "take up too much desk space." If you need more desk space, get a bigger desk, because 19-inch monitors are entry-level in the *Maximum PC* scheme of things, and 21-inchers are standard, end of story. Not convinced? Check out the nearest 21-inch monitor, and ask yourself if you can live without the extra screen real estate. Larger monitors make for bigger browser windows, provide a more immersive gaming experience, and let you multitask between apps without constantly rearranging your windows.

Assuming that you're going with a 19 or 21-inch monitor—and you will, oh yes, you will—be sure that your display can hit a high refresh rate at its maximum resolution, which should be 1600x1200 or greater for displays of these sizes. High refresh rates preclude the unbearable "flicker effect" that can cause eyestrain, so be sure your display can hit at least 75Hz at 1600x1200. A rate of 85Hz (and faster) at 1600x1200 is the mark of a great monitor.

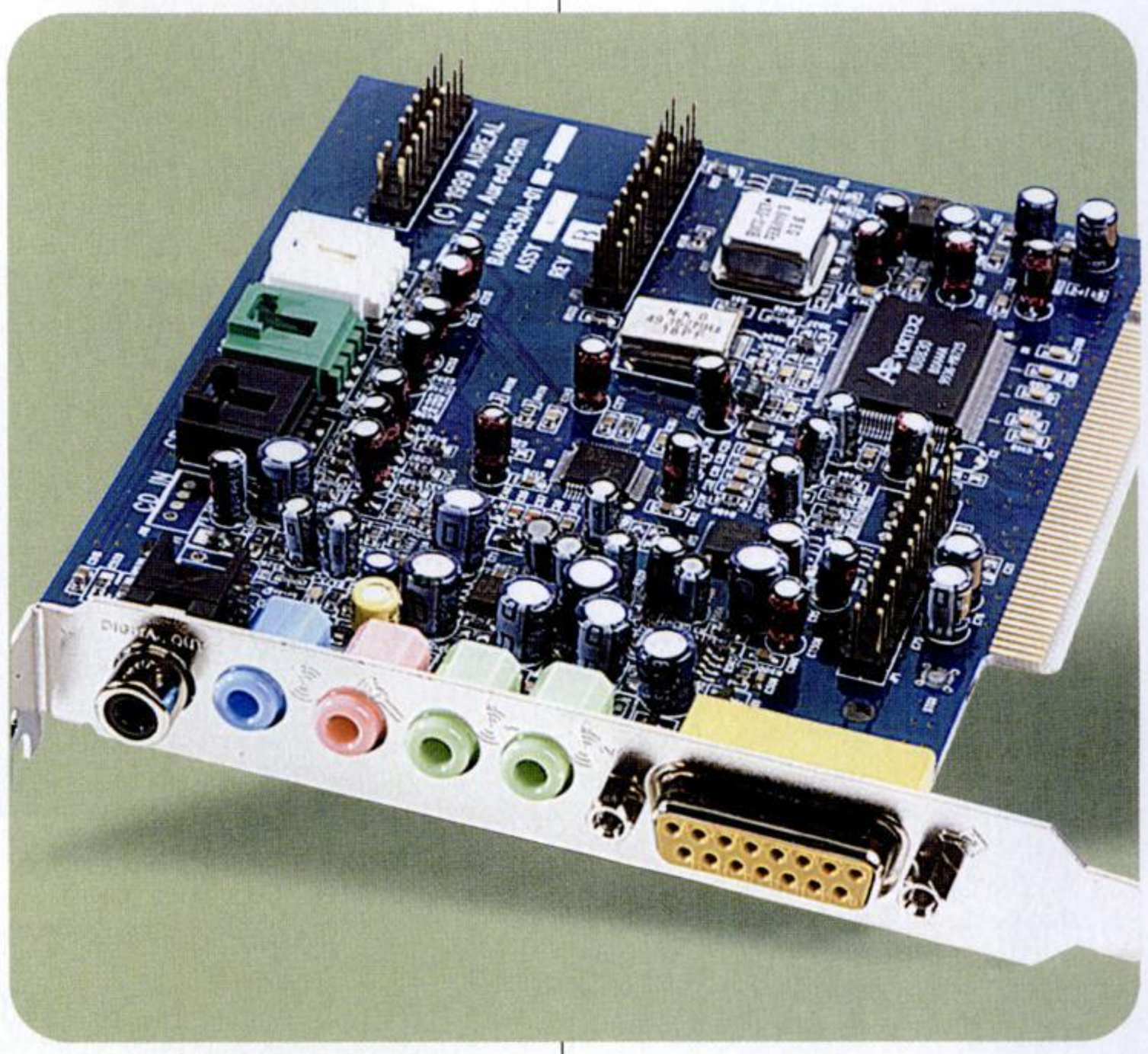
The last spec you need to care about is pitch—the amount of space between neighboring screen pixels. The lower the pitch spec, the higher the detail you'll see onscreen. We'd like to tell you to go for the lowest advertised dot pitch or grill pitch possible, but some monitor companies have begun misrepresenting their products by quoting only horizontal pitch. This makes for smaller spec numbers, but doesn't fall in line with the way monitor companies have historically reported pitches. Know that the finest pitch in the consumer universe belongs to Sony, which hits 0.22mm in its high-end line. That said, be just a tad wary of spec sheets that boast horizontal pitches.

While a screen's relative flatness isn't trumpeted in advertised spec sheets, this property can affect how much you enjoy your monitor. Bad shadow mask displays can be annoyingly convex; that is, curved on both the horizontal and vertical axes, creating a spherical effect. Most aperture grille displays also suffer from curvature, but are only curved on the horizontal axis, describing a cylinder rather than a sphere.

You can beat screen curvature altogether by upgrading to a new breed of monitors from Sony, Mitsubishi, and Samsung. We're talking about the Sony F400 (19-inch) and F500 (21-inch); the Mitsubishi 900u (19-inch) and 2020/2040u (21-inch); and Samsung 900IFT (19-inch) displays. These displays offer miraculously flat screens that are a joy to look at. In fact, if you're searching for the best monitor available anywhere, invest in the $1,900 Sony F500. Not only does it offer the much sought-after flatness, it also boasts resolution, refresh, and pitch specs that are out of this world. Can you live with 1800x1440@80Hz and a 0.22mm grille pitch? Yes, you can.

MONITOR UPGRADES

IF YOU HAVE...	UPGRADE TO...
Shadow mask	Aperture grille
17-inch and under	19-inch and over
75Hz at highest res	85Hz (and faster) at highest res
Curved screen	Flat screen



The Aureal Vortex 2 SQ 2500 offers everything you need in a next-gen soundcard: RCA S/PDIF jack, quad-speaker support, 92 hardware voices, and excellent 3D audio positioning.

SOUNDCARD

It isn't a good time to be in the soundcard business. Aureal just filed for Chapter 11 and Diamond is rumored to be dropping everything to become an Internet appliance company. The only soundcard vendor we're absolutely positive will still be around in six months is Creative Labs. If you're concerned with future support for your soundcard, the only safe bet is a Sound Blaster Live! Of course, if you upgrade to the correct soundcard, you can probably skate by without tech support, so choose your new card based primarily on hardware reliability, competent drivers, and supported features.

There are five basic traits to consider

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Dang. Forgot the racing stripes.

But that's about it, in terms of souped-up, sports-car qualities. Introducing TurboRing,™ the world's first trackball with patented Scroll Ring™ technology and three programmable buttons. Now, you can blast through long documents. And whiz through Web pages. All in sheer, ergonomic bliss. The idea of comfort and handling at high speeds is coming to a whole new Autobahn. Your desktop. For more information, visit www.turboring.com. And please, buckle up.

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in a soundcard: the number of hardware voices (3D and non-3D); the quality of the 3D sound effects; the input/output package; MIDI quality; and the software bundle. Here's the condensed version of what your new soundcard should have.

The number of hardware voices is key to your listening experience. Each separate audio stream, or voice, corresponds to an individual effect in your game. When you're playing *Half-Life* and hear gunfire, footsteps, or buttons being pushed, you're hearing a separate stream for each effect. As always, more is better. At the bare minimum, you'll want 32 3D-accelerated channels, and 64 normal channels processed in hardware.

By simply adding reverb, and positioning sound effects in a 3D field around your melon, a card can intensify your gaming experience. We like the Aureal-based boards for their kick-ass 3D positioning, but Sensaura-based boards, such as the Diamond MX400, are strong contenders as well. Unfortunately, the Sound Blasters leave a little to be desired in the 3D positional department, though they do excel at reverb and other environmental effects.

Be sure your next soundcard has: digital outputs for home-theater or digital speakers; a pair of old-school analog outs for legacy speakers and headphones; at least one input for a mic or tape deck; and a joystick/MIDI port. If you're missing these connections, you may find yourself in a bind when you buy that second pair of speakers for full 3D positioning. If you want the mother lode in I/O lovin', snag an SB Live! Platinum, with its front-mounted Live! Drive and I/O port interface. Supa-sweet!

MIDI used to be a big deal but, thankfully, unless you're a professional musician, that's no longer the case. Regardless, the more MIDI voices you have, the better off you'll be if you ever need them. Microsoft is hoping to revive MIDI with the next version of DirectMusic, so solid hardware MIDI support could become important next year when game developers begin using MIDI in their games.

After you've decided on the hardware, take a look at the chosen card's software bundle. Is a software DVD player included? How about audio editing utilities? An MP3 encoder? Old, crappy games? If you're going with a Creative Labs card, the answer is probably yes on all counts. The Creative Labs Live! cards are all basically identical, with specialized bundles and I/O configurations, and vastly different prices. As a general rule, first choose the hardware you want, then look to the bundle to narrow your options. You can always add software, and you can even add I/O ports on some Sound Blaster cards, but you can't add better 3D audio support.

The final factor to consider is the support-to-cost ratio. Aureal is likely to be bought out this year, and Diamond hasn't been so good about supporting legacy products. Though you can find Diamond and Aureal cards for cheap, you may find yourself in driver hell six months from now. The Sound Blaster cards are the most expensive and aren't the most technically advanced, but they do have a bundle for everyone and they produce good sound. Plus, you know the company will still be around in February 2001.

SOUNDCARD UPGRADES

IF YOU HAVE...	UPGRADE TO...
Sound on your mobo	Anything. Pick a PCI card to suit your budget.
Old ISA card (SB16, 32, AWE64 or worse)	SB Live! with the bundle of your choice.
Generic PCI card	Aureal Vortex 2 card, (or SB Live! based card, if you're nervous about continued support).
Aureal Vortex 1-based card	SB Live! X-Gamer, Aureal Vortex 2, or Diamond MX400, depending on your budget.
Original SB Live! Or SB Live! Value	Stick with what you've got, unless you want a Live! Drive.

Knowing how much a solid speaker system, such as Monsoon's MH-500, can improve your computing experience, why would you continue listening to the tinny speakers that came with your PC?

SPEAKERS

Since Creative Labs purchased premier speaker vendor Cambridge SoundWorks, it has subjected the world to a string of bunk speaker systems, each more disappointing than the last. But, finally, things are looking up. There has virtually never been a better time to upgrade that tired speaker system.

Behind the odd nameplate of Klipsch lies auditory deliverance. Preaching the gospel of high-decibel righteousness, the Klipsch Promedia rig is the first Perfect-10 speaker system to ever pass through the *Maximum PC* Lab. Combining bowel-shaking bass with the tight response of four loud sats, this amazing THX-certified 4.1 setup delivers 400 watts of pure audio ecstasy. And at a modest $250 list price, there's no reason anyone should hear less.

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If that's too big a hit for your wallet, but you still demand quadrophenia, a decent 4.1 rig can be had for about a $50 street price. For audiophiles on a budget, Labtec (yes, Labtec) produces the LCS-2514 system, complete with a 15-watt sub and four sats sporting dual 3D inputs.

If you can sacrifice the surround-sound experience, Monsoon's innovative flat-speaker technology can be had for around $70. While the sub on the low-end MH-500 system pales in comparison to the beefier sub on the 700 and 1000 models, the unique sound produced by flat sound sources is superior in many applications, especially desktop situations in which extreme volume isn't an option. The flat speakers produce an excellent soundstage with strong positional qualities, and they don't chew up a ton of real estate on your desk.

Venerable names that haven't lived up to their promise in recent years are emerging in today's speaker renaissance. Companies such as Altec Lansing and Boston Acoustics stepped up with excellent offerings that combine accurate response with quality design and construction, delivering powerful-yet-affordable setups. But prices can be deceiving. While strolling the aisles of your neighborhood computer superstore, you'll be confronted with a slew of speaker systems that span the price gamut. Remember: All that glitters is not golden-toned. Whenever possible, listen before you buy. We can attest that some sub-$100 setups can outdeliver systems selling for twice that price.

In this time of great audio wealth, one sad fact remains: Cambridge SoundWorks has yet to release a speaker system that lives up to the past glory and does its good name justice.

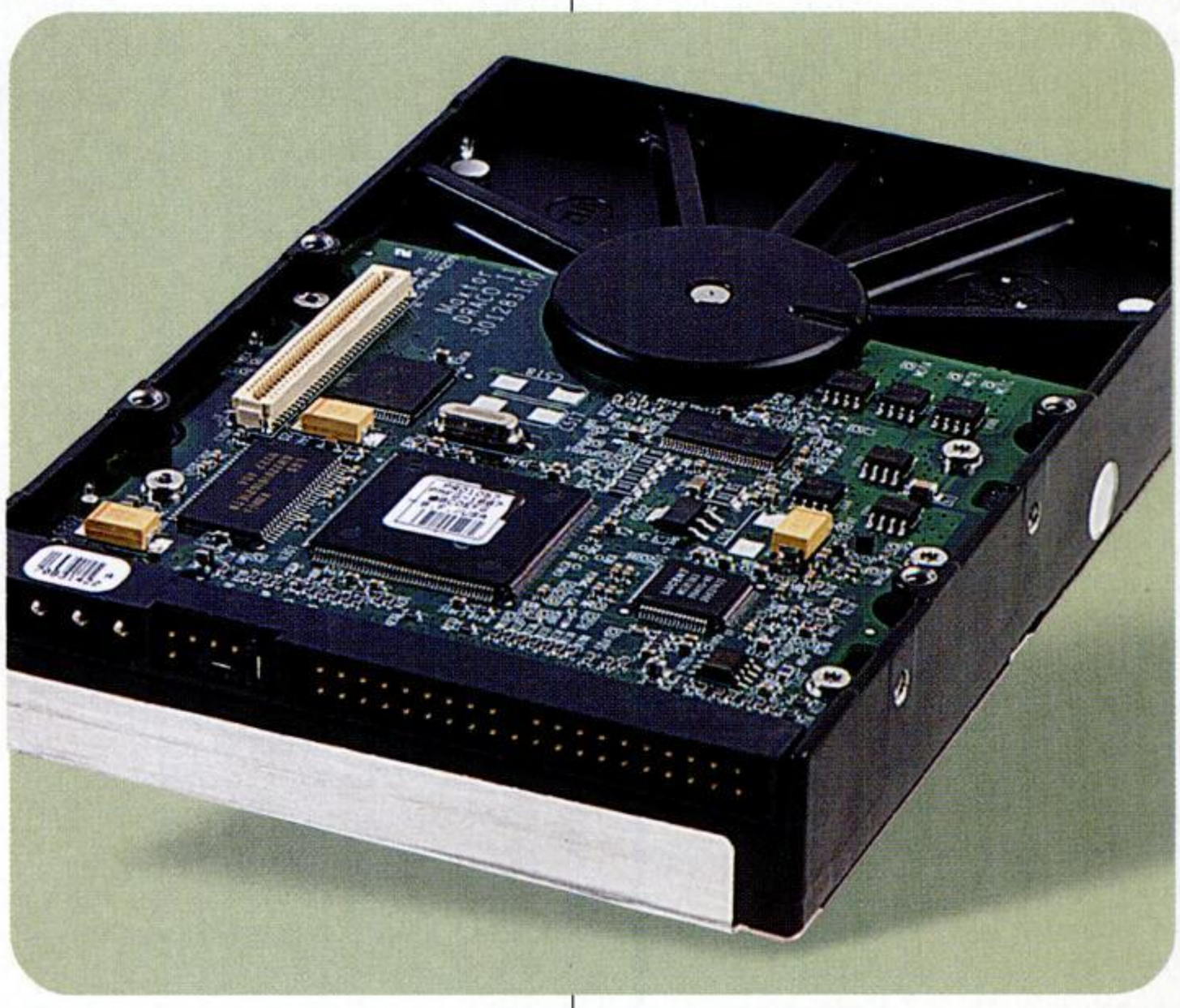
SPEAKER UPGRADES

IF YOU HAVE...	UPGRADE TO...
No-name speakers powered by the soundcard	Anything with independent power.
Stereo sats without a subwoofer	Add-in subwoofer (if your speakers support one), or a new three-piece rig.
Stereo sats with a subwoofer	Four-piece system coupled with a 3D soundcard.
Quad sats with a subwoofer	While the industry would have you think the next step is a 5.1 home-theatre system complete with center channel, we're not so quick to agree. In typical desktop configurations, the center channel is a gimmick; the signal is lost in the relatively cramped setup with sats flanking your monitor.

HARD DRIVE

A year ago, no one thought drive manufacturers would ever release 40GB to 75GB consumer hard drives. But with broadband connectivity on the rise, more people are finding that the 18GB (and smaller) capacities of last year's drives insufficient for all the movies, MP3s, game demos, and porn they're downloading. In fact, the online music craze has grown so big, hard drive manufacturers cite the storage of MP3 files as a major reason for upgrading to a larger drive. Another factor contributing to expanding drive capacities is the rising popularity of set-top boxes and personal video recorders (PVR), such as the Tivo, which record shows directly to hard drives. Since video gobbles up gigabytes like nobody's business, the bigger the hard drive, the more functionality you get from your PVR.

Besides the increase in storage space, a new hard drive should add a little pep to your system and increase overall system performance. Of course, the fastest hard drives are also the most complex and expensive, so be prepared to sink some serious cash into your platter rattler. Older, slower drives are certainly cheaper, but we suggest you get a hard drive that uses the latest technologies—it will contain innovations that help ensure stability, reliability and longevity.



When it comes time to ditch your old 6GB drive, you can't go wrong replacing it with a Maxtor DiamondMax 40GB ATA/66 hard drive. It's big and fast, just the way we like them.

High-performance drives are built with the fastest spindle-speeds and highest areal densities. Typically, a performance drive will sport breakneck spindle speeds (at least 7,200rpm, and up to 10,000rpm speeds for SCSI-based drives) and a larger onboard cache and higher areal densities than the average drive. If you're shopping for a performance drive, accept nothing less than 7,200rpm UDMA/66 or Ultra2 SCSI hard drive.

Of course, you don't need 10,000rpms

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if you're only interested in packing away more downloads. It may be wiser to purchase a larger, non-performance drive with greater storage capacity as a companion to a fast primary drive, especially if you're happy with the way your primary drive runs. Though targeted toward low-end machines, value drives add a lot of cheap storage space for large files and MP3 collections; they're normally larger than performance drives by around 5GB to 10GB. While the overall average throughput of a value drive is typically 8 to 10MB/sec slower than high-performance drives (which currently range from 25 to 30MB/sec), they're still fast enough to stream most audio and video content.

Should your next hard drive be SCSI or UDMA/66? If you want the fastest thing out there, go SCSI—but get ready to pony up some hefty ducats. SCSI drives are pricey because they contain expensive monitoring chips and run at 10,000rpm. SCSI drives also require a high-end SCSI host adapter that plugs into a PCI slot, which drives the price even higher. High-end SCSI drives typically go for between $300 and $1,000, depending on the spindle speed, drive size, and connection technology used. Typically, the home enthusiast can get by with an Ultra2 SCSI-based drive, although Ultra160 is the flavor. Ultra2 doubles the total bus throughput of Ultra Wide SCSI to 80MB/sec by increasing the clock rate to 40MHz, while Ultra160 doubles that rate again to 160MB/sec. Since a single SCSI-based drive has a typical transfer rate of only 30 to 40MB/sec, you can see why Ultra2 does just fine. Of course, the newer Ultra160 drives contain new technologies and higher areal densities, and thus offer higher performance, which is a good reason to consider the latest and greatest.

The current ATA standard is UltraDMA/66, though you can expect to see UDMA/100 drives and controllers in the last half of 2000. UDMA/66 doubles the previous total bus bandwidth of UDMA/33 to 66MB/sec, and UDMA/100 is expected to take this to—you guessed it—100MB/sec. If you purchased your machine before Christmas of 1999, you're likely stuck with UDMA/33 support, but you can add a UDMA/66 controller, such as the Promise Ultra66, if you want to upgrade to a supa-fast hard drive. UDMA/66 drives work with UDMA/33-based controllers, but you'll lose those 66MB/sec burst speeds.

HARD DRIVE UPGRADES

IF YOU HAVE...	UPGRADE TO...
No space on an older PC that supports only ATA drives	30GB ATA drive running at 5,400rpm.
No space on an older UDMA/33 machine	5,400rpm 30GB ATA drive or Promise Ultra66 controller, and 30GB UDMA/66 drive running at 5,400 or 7,200rpm.
Slow hard drive, and need the fastest IDE performance available	Promise Fastrak RAID or Iwill SIDE-RAID66 controller and two 20GB UDMA/66 7,200rpm drives.
Slow hard drive, and need the kind of speed that only SCSI offers	Ultra160 SCSI controller and a 10,000rpm 18GB Ultra2 SCSI hard drive.
Space and need the extreme speeds offered only by high-end SCSI	Ultra160 SCSI controller and a 10,000rpm 36GB Ultra160 SCSI hard drive.
Need to spend a lot of money on the ultimate in hard drive performance and capacity	Ultra160 SCSI RAID controller and two 10,000rpm 36GB Ultra160 SCSI hard drives.

Orb isn't the household name that Iomega is, but with 2.2GB and fast read/write speeds, it's only a matter of time. The Orb is a happy medium between cartridge drives and tape drives.

REMOVABLE STORAGE

Removable storage options fall into two categories: small, portable cartridge drives and big, bulky backup tapes. Which you should go with depends on your needs.

If you're a graphic artist who needs to shuttle large images back and forth between work and home, cartridge drives are the way to go.

If you're archiving legacy data that won't be accessed very often, backup tapes are best.

The two big players in the game of smaller removable storage are Iomega's Zip drives and Imation's Superdisk. The right one for you is really a matter of preference, since both companies offer internal, external, and notebook options

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With Other Sound Cards You Hear Him Empty His Weapon.

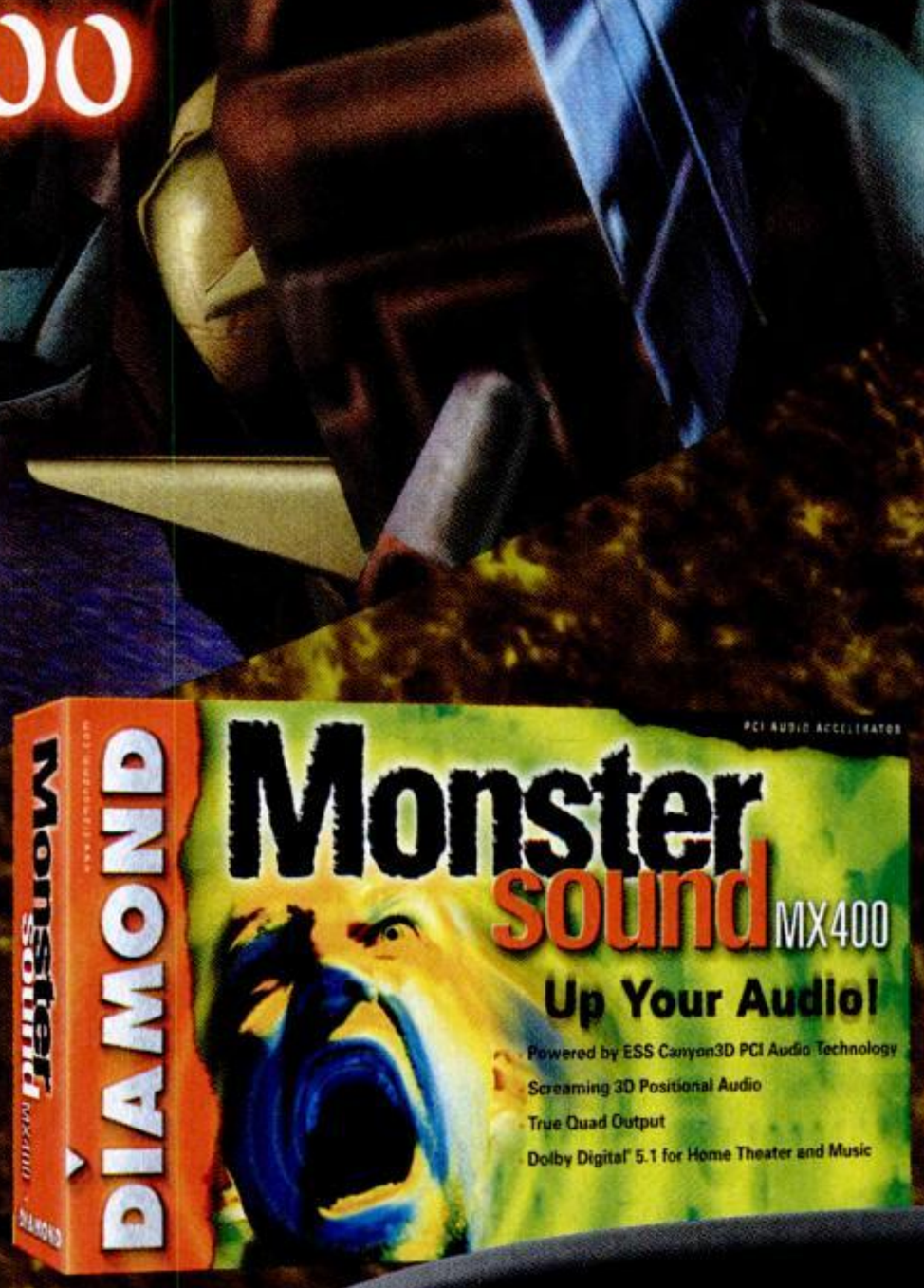
With Monster Sound MX400 You Hear Him Empty His Bladder.

S3's Diamond Monster Sound MX400 will rock your PC audio world. Based on ground-breaking technology from ESS and Sensaura, the Monster Sound MX400 adds a whole new twist to your gaming experience with scorching 3D positional audio, so now you hear sounds on a whole new axis—above and below you. And with true quad output and Dolby Digital® surround sound, you create the ultimate PC home theater. Plus you can play, download, store and manage the hottest digital audio formats on the Internet or copy tracks from your CD collection to build your own high quality MP3 files!*

SO UP YOUR AUDIO WITH MONSTER SOUND MX400—truly in a class by itself!

Screenshot of Slave Zero courtesy of Accolade.

**Requires Dolby Digital receiver*



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AUDIO GRAPHICS COMMUNICATION HOME NETWORKING

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ranging in price from $80 (internal) to $150 (external). While the Superdisk offers an extra 20MB of storage, we've found Zip drives to be faster and essentially ubiquitous. Zip also offers a 250MB drive with USB support, for around $180. Whether you're on a notebook or an older desktop, Zip drive upgrade options abound.

If you're looking for more space and muscle, check out Castlewood's Orb Drive, which offers 2.2GB backup in both internal and external USB/SCSI options. The internal drive will run you about $210; the external figures in at $240 for SCSI and $290 for USB. Iomega's 1GB and 2GB Jaz drives are also an option—available in internal and external SCSI, as well as USB. Just be aware that Jaz drives suffer from slow read speeds, and that Jaz cartridges have a tendency to break down over time. They're also a little pricey ($360 for both internal and external 2GB SCSI).

If you're hardcore about backing up your data, OnStream offers impressive tape backup systems ranging from 30GB to 70GB. A 30GB internal IDE drive will run you $300. For $400, you can snag a USB version, or if you really want speed, you can drop $600 on the external SCSI option. OnStream's *Echo* software package lets you archive your entire hard drive and make continual saves according to a schedule. The *Echo* package also registers the drive with a letter designation, so you can swap files and access your backup whenever you want. For hardcore tape backup that's still accessible, OnStream is the way to go.

Removable storage technology doesn't change often, so the Zip drive you buy today won't be obsolete tomorrow. Keep in mind that Castlewood isn't a household name just yet, so you may run into compatibility problems if you're swapping data with friends.

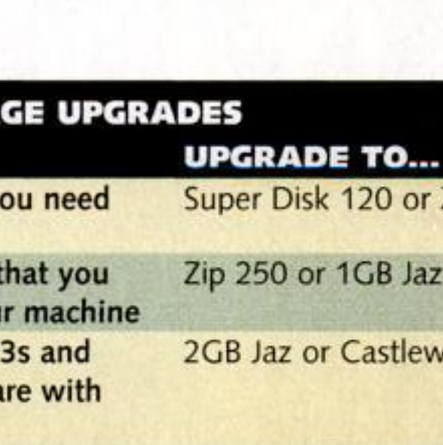
The bottom line is, if you're swapping files or sharing *Photoshop* projects with others, a data transfer system like the Zip 100 is best. If you're working with digital video, or if your collection of Britney Spears pics is taking up 17 Zip disks, it's time to move to something bigger, such as a Jaz drive. On the tape backup side, you sacrifice speed for size—the larger the disk size, the longer the read/write times—but waiting for backup is better than sifting through the wreckage of a power outage or a system crash.

REMOVABLE STORAGE UPGRADES

IF YOU HAVE...	UPGRADE TO...
Lots of large files that you need to take with you	Super Disk 120 or Zip 100.
Graphics or music files that you need to move off of your machine	Zip 250 or 1GB Jaz drive.
Several gigabytes of MP3s and pictures you want to share with friends and family	2GB Jaz or Castlewood Orb drive.
Lots of data to archive	OnStream 30GB tape backup.

CD/DVD

DVD or CD-R? It may be tempting to upgrade to a combo DVD/CD-R drive, such as Ricoh's Media Master, but our testing has shown them to be slow and finicky. For now, go with a CD-R drive.



In January's "Millennium Survival Guide" feature, we predicted that 2000 would be the year CD-RW dominated desktops, and we're still singing that song. DVD has failed to garner anything more than an enthusiast following—besides, who likes to watch movies sitting at the computer? On the flipside, using a plain-old CD-ROM drive is so 1998. Right between these two "limited purpose" extremes lies the CD-RW drive, which can read CDs, burn CDs, and extract audio from your CD collection faster and more reliably than most DVD and CD-ROM drives could ever hope to.

So which CD-RW is the best? The answer depends on whether you go SCSI or IDE. SCSI drives are immensely better for CD duplication. Compared to IDE's single-threaded I/O interface, which executes just one I/O request at a time, the SCSI bus is built to handle up to 256 simultaneous threads of data. SCSI's more robust I/O interface, combined with its lower CPU overhead, means it provides CD-RWs with smoother data transfers than IDE can offer. When burning a CD, you don't want anything sharing the resources dedicated to keeping the burner's cache full, so the fewer distractions the drive has, the better your chances of not burning a coaster. IDE users usually tiptoe around their PCs when burning CDs, out of fear that they'll cause a buffer underrun. SCSI users, however, can play a game, surf the net, or even launch a DoS attack while burning a CD.

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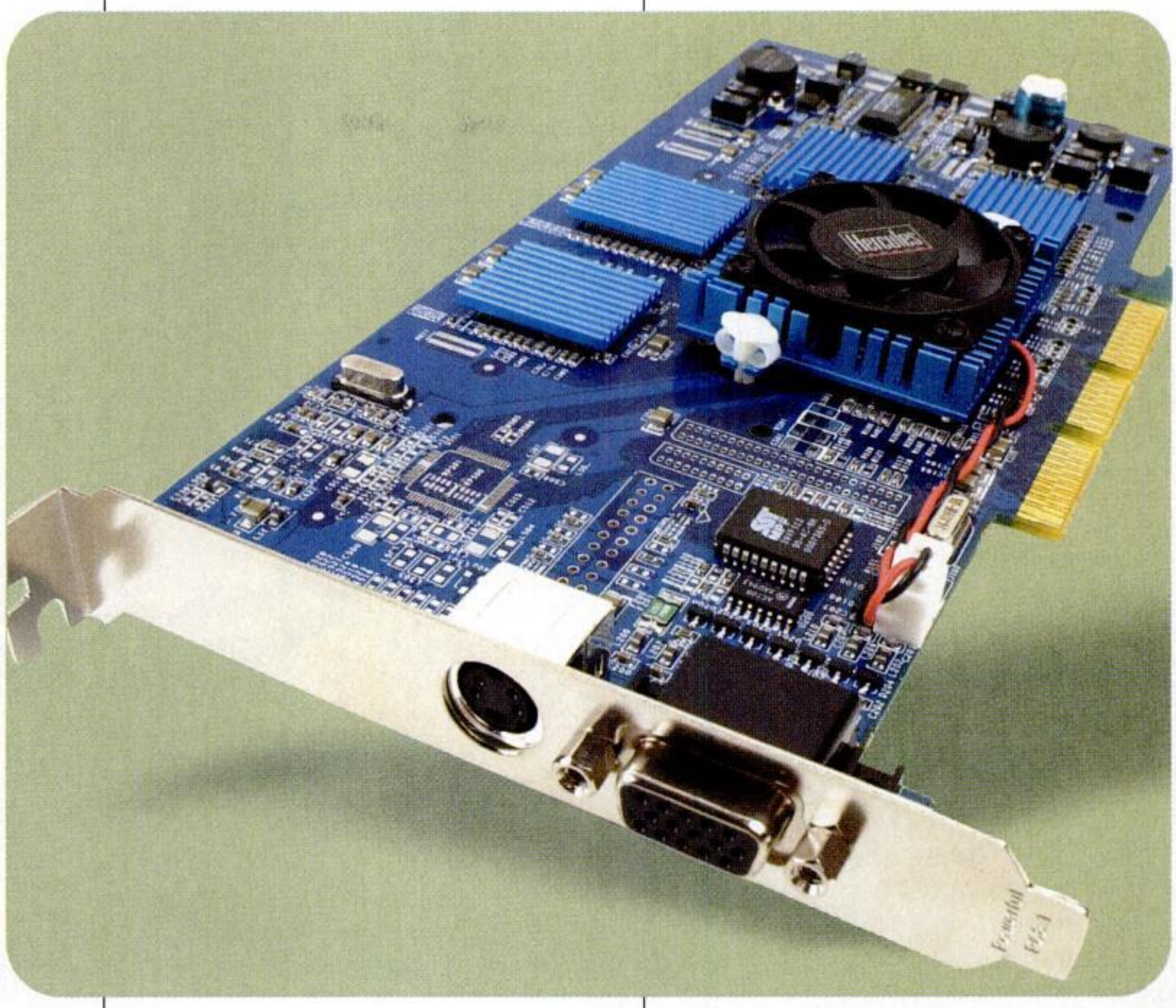
The fastest SCSI drives now record at 12x, but many CD connoisseurs are content to record at slower speeds for consistency's sake, so an 8x or 6x drive will suffice. For IDE users, the fastest speed on the market is 10x record, 4x rewrite, and 32x read. IDE drives can record as quickly as SCSI drives of similar specification, but suffer from residence in the IDE chain, and the drives require excessive CPU resources to function properly. Most IDE users should be content with a slower drive until 12x burners drop in price.

You also you need to decide whether you're going to use your CD-RW for evil—audio extraction or copying of games. If you want to make copies of games, you need a drive that does bit-for-bit accurate copying. This allows the drive to record bad sectors purposely placed on a disc to foil CD duplication programs, and lets you create exact copies of all games. For audio extraction, a crappy drive will record songs with hisses and pops, and will typically do so at a slow pace. Good drives will correct any errors automatically, or won't suffer errors in the first place, thanks to alignment technology built into the drive for increased accuracy in extraction and quick, high-quality audio work.



CD/DVD UPGRADES

IF YOU HAVE...	UPGRADE TO...
DVD-ROM	At least a 6x/4x/24x CD-RW.
CD-ROM	At least an 8x/4x/32x for CD duplication.
4x IDE CD-RW	10x/4x/32x drive.
6x SCSI CD-RW	If you're the impatient type, upgrade to a 12x recorder. Just think—six minutes to fill an entire disc.

VIDEOCARD

New graphics processors are being introduced with increasing frequency, so it's getting more and more difficult to stay on the cutting edge of 3D. Just when videocards based on the latest and greatest 3D chipset arrive in stores, another chipset, with new features that promise to rock your world, is announced. But, while nothing seems to suck more than buying a top-of-the-line GeForce DDR board just in time to hear the GeForce 2 announced, don't despair. The truth is, you may not even need a GeForce 2.

To determine your true 3D hardware requirements, look to the games you play. Don't bury your head in the sand and pretend that features such as full-scene anti-aliasing and hardware transform and lighting are unimportant, but do consider the fact that they might not be important to you right now. How much innovation do you really need if all you play are 2D realtime strategy games and *Diablo* clones?

On the other hand, first-person shooter fans need single-cycle multitexturing, geometry acceleration, and ultra-high fill rates. And if you're a flight sim freak, the FSAA features on such videocards as 3dfx's Voodoo5 will definitely improve your flying experience.

Depending on what games you play, you may not need a new card at all. But if you do, get yourself a GeForce2-based card, such as the 3D prophet II.

The base capabilities you should look for in a videocard are 32-bit color rendering, single-cycle multitexturing, and fill rates that hit at least 350 megapixels per second. Without decent fill rates and support for single-cycle multitexturing, all the visual treats in games such as *Unreal Tournament* will bog down your frame rates. Current games are designed with multiple 32-bit textures used as bump maps, light maps, and detail maps. More textures are being applied to a single pixel, so 16-bit color just won't cut it anymore—the dithering artifacts, color banding, and crappy-looking alpha blends will ruin your gaming experience. True color-rendering shows your 3D in the best light possible, so be sure your hardware does it and does it well.

The rapid production of 3D chipsets puts a lot of innovation in your corner, but the key is to keep an eye on what features are important. New 3D chips launch every six to eight months, and

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chipmakers each tout the features that set their offering apart from the crowd. Last year, S3 talked up its texture compression, Matrox bragged about its bump mapping, and nVidia asserted the advantages of its hardware T&L. And don't worry if your next card doesn't support DirectX 8.0 pixel shaders, for instance, because no game will use them until next year. As important as hardware transform and lighting support is in the grand scheme of 3D acceleration, it doesn't mean squat when there aren't any games available to take advantage of it. By the time hardware T & L pixel shader games are stocking store shelves, brand-spankin' new videocards will run circles around the current generation of hardware.

Chipmakers such as nVidia keep an aggressive schedule so they can stay in step with the hardware refresh cycles of the major OEMs. If you have pockets as deep as Dell and Micron then by all means, continue to buy the latest and greatest.

If you don't need the advanced features, just sit tight on the hardware that you have. At some point, you'll buy a game that brings your TNT2 Ultra to its knees. When that happens, buy the fastest thing out there and hope it doesn't become obsolete before the year is out. ✹

Future Prophecies

If you think computing can go only so far and no further, think again. We'll see speed advances this year that'll put your PC to shame. In Q3, Intel should introduce its replacement for the gray-haired Pentium III. Codenamed Willamette, the new CPU will be the first new 32-bit CPU from Intel since the Pentium Pro. We're pretty sure that Willamette will be named Pentium IV, and will come out swinging at speeds greater than 1.3GHz. We also expect it to feature a 400MHz system bus and math units flying along at twice the core speed. Cache size is still unknown.

Intel's real secret weapon, however, may be in the Willamette New Instructions (WNI). Like the MMX and Katmai New Instructions of yore, these 72 new commands allow the CPU to take shortcuts in complex operations, speeding up 3D graphics and multimedia. Since Intel is the dominant force in PC computing, almost all software developers are likely to compile for Pentium IV, thus making any new program faster.

This year, we'll also see Intel's first 64-bit CPU, the Itanium. While consumers don't yet need 64-bit computing, those who need to juggle terabytes of data in RAM will get a shot in the arm; it's expected that an Itanium-based server running quad CPUs and, say, eight terabytes of RAM, can replace a row of older machines and offer faster performance, because entire databases can remain resident in RAM instead of residing on infinitely slower hard drives.

PC I/O devices are about to receive a major enema as well. By early 2001, most PCs will come equipped with USB 2.0, serial ATA, and DVI connectors. The ISA bus will finally die the horrible death it so deserves.

This past year marks the first time AMD posed a serious threat to Intel's dominance. After it was introduced, the Athlon ran ramshackle for months over Intel's best. By the time you read this, AMD may have done it again with its secret Thunderbird CPU. Using the same basic core of the Athlon, Thunderbird will feature Level 2 cache running at full speed, and will likely surpass Intel's P-III in performance. Thunderbird will also use more efficient copper interconnects, instead of aluminum. Copper alone is expected to give Athlon a 15 percent boost in performance. For cost-conscious folks, AMD will soon introduce its Spitfire CPU. Designed to take on Celeron, the low-cost CPU is rumored to be faster than even the current-production Athlons.

Also on the horizon for AMD is the Sledgehammer CPU, which promises 32-bit compatibility and the ability to address terabytes of memory. Perhaps someday, we'll even have software that takes advantage of all these hardware advances. Dare to dream.

VIDEOCARD UPGRADES

IF YOU HAVE...	UPGRADE TO...
Videocard integrated into your motherboard	A TNT2 or Voodoo5 PCI card
Savage3D, Permedia3, PowerVR Series 2, Savage4, i740	Anything is better than what you have now. If you want something to tide you over until the big guns are released this fall, pick up a 32MB TNT2 Ultra or Rage 128 board.
TNT, Voodoo2 SLI, G200, Voodoo3	It's time to move on to a more capable videocard. Any of the upcoming generation of boards based on Voodoo5, GeForce 2, or Radeon 256 should keep your pixels pumping for another year or so.
TNT2 Ultra, Millenium G400, Rage 128, Savage 2000	If you can't stand any slowdown in your games, upgrade to a GeForce 2. Otherwise, just grin and bear it for six months, and upgrad to something truly revolutionary.
GeForce DDR	You're sitting pretty. Wait until nVidia's NV20 and 3dfx's Rampage arrive this fall.

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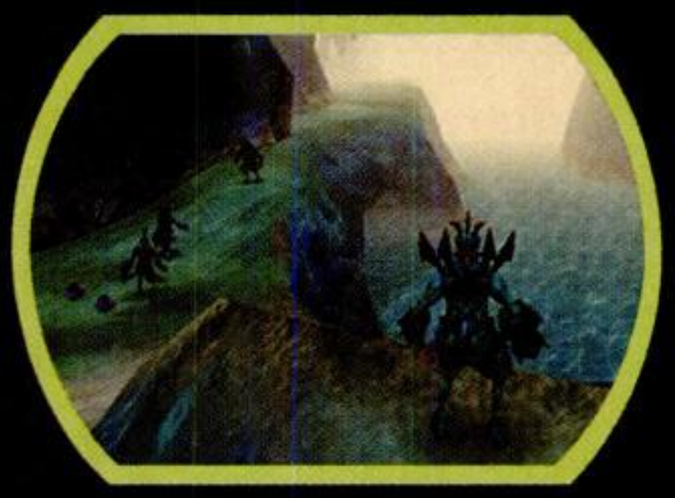

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POWER

Go to Work on Your PC With These 21 Indispensible Tools

Try to tweak your PC all you want, but without the right tools for the job, you won't get far. Power users need power tools—but if you're using Windows, you already know that what Microsoft provides is more Fisher Price screwdriver than industrial-strength drill. Good thing the Internet is a veritable Home Depot of utilities available for cheap, or even for free. Granted, a lot of it is so useless, you couldn't pay us to take it, but there's a slew of shareware and freeware programs that actually pack some punch. Strap on your safety goggles—we're hauling out the heavy-duty utilities that no power user should be without.

by Lenny Bailes

WARE

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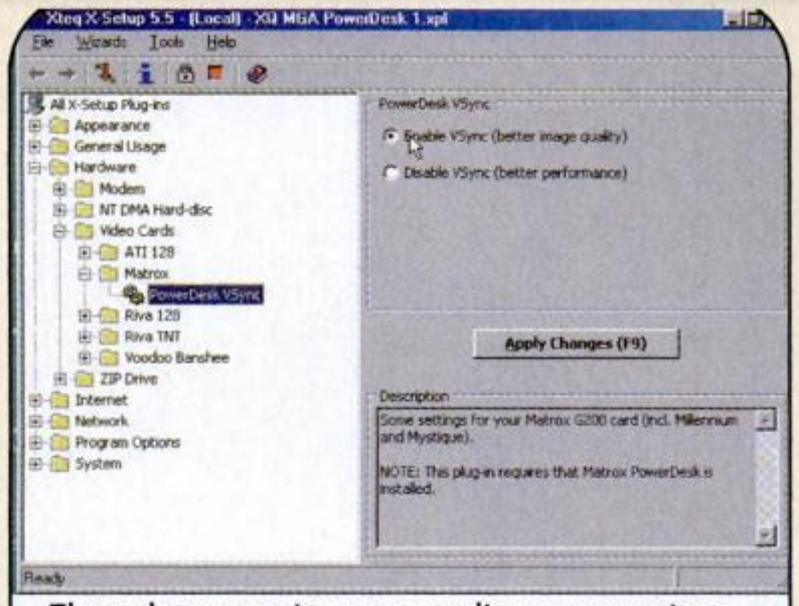
X-Setup



Through an easy-to-use cascading menu system, *X-Setup* gives you access to important hardware tweaks that improve your PC's performance.

A Windows super-tweak utility, *X-Setup* offers fewer cosmetic-enhancement options than *WinBoost 2000*, but equips you with myriad Appearance, Program Option, Internet, Network, and System options, all neatly organized in a cascading menu. *X-Setup* also offers a group of hardware tweaks that you won't find in competing packages. You can speed up serial port speeds, auto-activate hard disk DMA options, and—best of all—toggle high-performance options for a variety of ATI, Matrox, nVidia, and 3dfx videocards. You can also use *X-Setup* to activate special Pentium III driver commands, enable OpenGL optimizations, and dig into performance tweaks specific to each 3D chipset. We were even able to toggle v-sync on our Millennium G400 Max—something Matrox doesn't allow through its safe-but-limited drivers.

Free; Xteq Systems; www.xteq.com

WinBoost 2000 Gold

It's common knowledge that Windows 95/98 can be customized and tweaked to a much greater extent than Microsoft allows in the Control Panel and Explorer configuration menus. Tweak UI, developed internally by Microsoft's own programmers, was an early attempt at giving Windows users access to the sub-basement of wiring boxes and hidden switches buried under the surface of the Windows interface. Unfortunately, Microsoft found it too troublesome to keep this utility up to date, so it has disappeared from the Windows 98 SE CD. No matter—*WinBoost 2000* builds upon the concepts in Tweak UI, providing an easy-to-use interface that yields access to hundreds of Win95/98 cosmetic changes and performance tweaks. Use it to modify Windows boot options, change system icons, and heavily customize *Internet Explorer* and *Outlook Express*. Especially impressive is the customization menu that lists more than 200 tips and tricks you can use to control Windows' behavior.

$25; Magellass Corporation; www.magellass.com

AutoMate 4.4

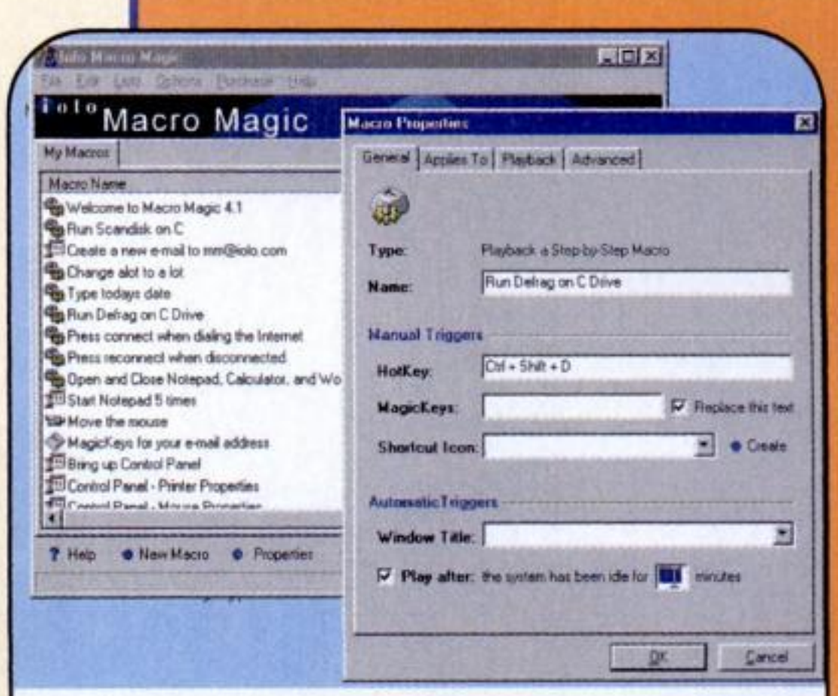
AutoMate is a Windows scheduling application par excellence. Use it to automate simple tasks such as running ScanDisk or Defrag on your hard disk every week, or for complicated conditional procedures such as logging into your ISP every Friday, checking e-mail, and cleaning up your mailbox if 20 or more messages have arrived. *AutoMate* allows you to create scripts that launch at specific times, in any DOS or Windows program. Events can be linked to simple or complex macros, so you can send keystrokes to a single application, or fashion complex scripts involving multiple applications. Versions of this program exist for all flavors of Windows, including Windows 3.1, Windows 95, and Windows NT.

$60 for Standard Edition, $180 for Professional Edition; Unisyn; www.unisyn.com

Macro Magic

Macro Magic records and plays back ordinary keystrokes, special Windows keys, mouse movements, and clicks used in any specified application—or even those used between applications. It's easy to devise scripts that automatically dial into the Internet, collect e-mail, and initiate web downloads. The advanced macro feature can apply a series of keystrokes into a window as soon as it appears on the desktop.

We used *MM* to give new flexibility to the Microsoft Backup program that's bundled with Windows 98. We've got Task Scheduler opening Backup at specified times and conducting a series of keystrokes that loads a backup job, begins the backup process, and closes the program upon completion. *Macro Magic* is also handy for automating repetitive data entry. Since it captures mouse strokes and clicks, you can use it to reconstruct page layouts or duplicate design elements in a drawing program.



With *MacroMagic*, you can create complex scripts to automate all the repetative processes that bog down your computing experience.

$40; Iolo Software; www.iolo.com

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TurboBrowser 2000

Though it lacks *Drag and File's* multiple drive displays and file sorting options, *TurboBrowser 2000* is the file manager for you if you need to view and manipulate multiple graphics, word processing, or spreadsheet files. *TurboBrowser's* triple display window lets you view the directory tree, folder contents, and individual documents, all at the same time. The latest version also includes an offline web site retriever, and a customizable quick-backup feature that stores user-selected documents in a safe place of your choosing.

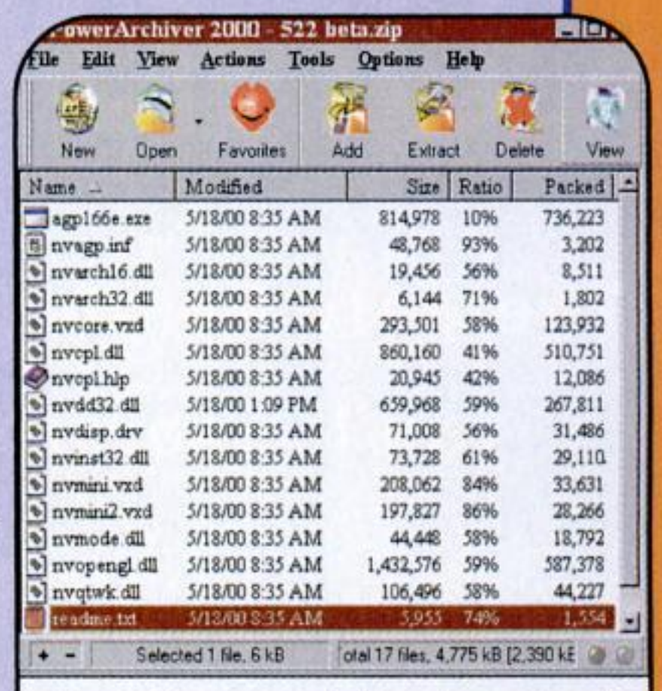
Ever wanted to select 50 files in an Explorer window, choose the Print option, and go for a cup of coffee? *Turbo Browser's* print queue can hold and manage documents associated with a variety of programs and print them all, without generating printer time-outs or crashing the system. Similar queues are available for zipping and unzipping, bitmap file conversion, file viewing, and multimedia playback.

$80 ($70 without TurboZip archive manager); Filestream; www.filestream.com/turbobrowser

Power Archiver

If you want to stick with Windows Explorer as your file manager but need to add a good archive manager to your desktop, pick up *Power Archiver*. A freeware ZIP manager with a familiar, *WinZip*-like interface, *Power Archiver* supports LZH, TAR, GZIP, and Windows CAB formats in addition to PKZIP files. It supports spanned ZIP files and right-click shell extensions, allowing you to quickly unpack archived files through Windows Explorer. Best of all, it's free—unlike *WinZip*.

Free; e-Front Media; www.powerarchiver.com

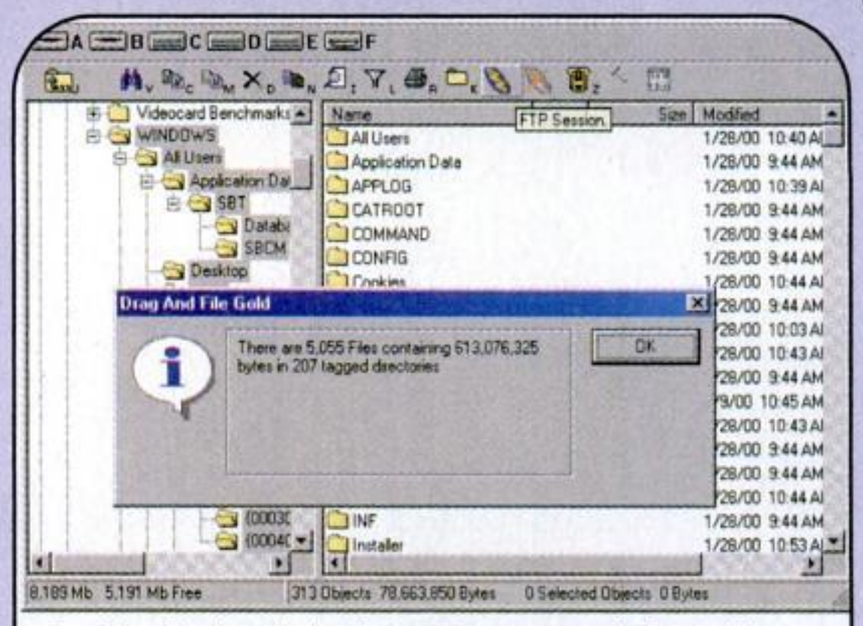


Borrowing many interface elements and features from *WinZip*, *PowerArchiver* handles all your compression needs, and does it for free.

Drag and File Gold 4.5

Though it faces some heavy competition from *TurboBrowser 2000*, *Drag and File Gold* is the champion Windows file-manager package. It includes all the features that Microsoft left out of Windows Explorer: extensive file sorting options; side-by-side file listings; a built-in ZIP archive manager; an FTP utility; and popup toolbar enhancements. With *Drag and File Gold's* Multilaunch feature, you can create multiple right-click options to open JPEGs, MP3s, and other files, in a variety of different programs. The bidirectional Synchronize Directories option thumps Windows Briefcase in terms of functionality; use it to quickly synch the file contents on a notebook computer and a desktop machine, or to update work folders on a file server. The multipane file display window makes browsing your hard disk a breeze, and it's easy to dump directory listings to a printer, edit file creation dates and times, and sort and display file listings by extension, date/time, size, or attributes. Drag-and-drop default behavior can be modified to "always copy" or "always move" selected files. The Drag and Zip archive manager can compress and decompress ZIP, TAR, GZ, Microsoft CAB, and LHARC archives on-the-fly or through right-click shell extensions.

Drag and File includes a virus checker that's limited to detection and disinfection of COM and EXE viruses. It also offers flexible Task and Application Launch bars, and a virtual screen utility that extends the size of your Windows 95/98 desktop and allows you to create and switch between 10 full-screen desktops. If you're looking for a file manager with Swiss Army knife functionality, *Drag and File Gold* delivers.



Besides the handy built-in FTP, *Drag and File Gold* includes many powerful tools that help you manage the wild jumble of files that populate your hard drive.

$50 ($30 without Drag and ZIP archive manager); Canyon Software; www.canyonsw.com

ACDSee 3.0

Looking to organize folders full of graphic images, or to prepare images for web publication? *ACDSee* can shave tons of time off the task. It includes a quick-preview browser, a slide show creator, a thumbnail display feature, and a photo enhancer that supports 26 PC image formats. *ACDSee* also has TWAIN scanner support, and enables browsing of pictures stored in Kodak digital cameras, so you can transfer selected images to your hard disk. You can also review images stored on the camera, then open them directly from the display window into an editing application, such as Adobe *Photoshop*. It's easy to select a directory of images and instantly create a thumbnail database with *ACDSee*, and the HTML album generator can automatically create a neat, labeled web page of thumbnails for an online graphic library.

$50; ACD Systems; www.acdsystems.com

DOSLFNBK 2.5

Tired of lame Windows backup utilities? Wishing for a way to set up an emergency recovery system from good old DOS? Normally, the long filenames in Windows 95/98 stop you from doing this, but D.J. Murdoch's *DOSLFNBK* bypasses the problem. It easily records and restores long filenames and file attributes from within Windows 95/98, Windows NT, or a true MS-DOS command prompt. This makes it possible to use older DOS-based backup and archive programs to restore Windows to a corrupted hard disk, or to duplicate a default Windows configuration. *DOSLFNBK* also enables recovery from a catastrophic disk crash without reinstalling and running Windows in order to get to your backup program. Version 2.5 supports Win95/98 FAT32 partitions and FAT16 partitions with cluster sizes larger than 32K.

$10; D.J. Murdoch; www8.pair.com/dmurdoch/programs/doslfnbk.htm

ClipMate 5.1

With *ClipMate*, you'll get much more from the Windows Clipboard than Microsoft put into it. With the Macintosh-like Multiscrap feature, you can save an unlimited number of text and graphic images into groups called Collections. Then you can use *ClipMate's* Powerpaste feature to choose a series of entries from a Collection and paste them into a single document. You can also use *ClipMate* to create a rough-and-ready address database or memorandum file, by cumulatively cutting information out of documents and storing it in a single clipboard collection.

$20; Thornsoft Software; www.thornsoft.com

Zone Alarm

The Internet houses some wolves in sheep's clothing, and once you convert your connection to an "always on" DSL or cable modem configuration, you increase the odds that the rascals will pick up the scent of your home network. *Zone Alarm* helps protect you without making you struggle with the intricacies of port monitoring, proxies, and permissions. And unlike competitors that deliver a comparable degree of security, it's free.

Rather than forcing you to choose from a series of complex options to set security permissions, *Zone Alarm* begins working as soon as you install it, screening TCP/IP traffic both to and from your computer. It's smart enough to automatically distinguish the difference between local area (local subnet through a NIC) and Internet traffic. By default, it allows local network access to Windows services and file and printer shares, with NETBIOS visibility to other computers on your subnet. When it comes to IP routes outside your local subnet, *Zone Alarm* is a watchful bear; *all* port connections are closed until you grant access to individual programs on a case-by-case basis. *Zone Alarm* can prompt you each time a local or remote application wants to access a port, or grant ongoing permission for each application. People can't ping you unless you add their IP addresses to your local subnet, and virus 911s are a thing of the past—if a remote computer tries to hit you through NETBIOS, *Zone Alarm* automatically denies permission, without interfering with the normal web browser cookie process. If your computer is under attack, the Lock button on the Windows taskbar lets you instantly shut off all incoming and outgoing Internet access.

With *Zone Alarm*, you can customize the Internet access permissions for each and every app that accesses the outside world.

Free for personal or non-profit use; $20 for business use; Zone Labs; www.zonealarm.com

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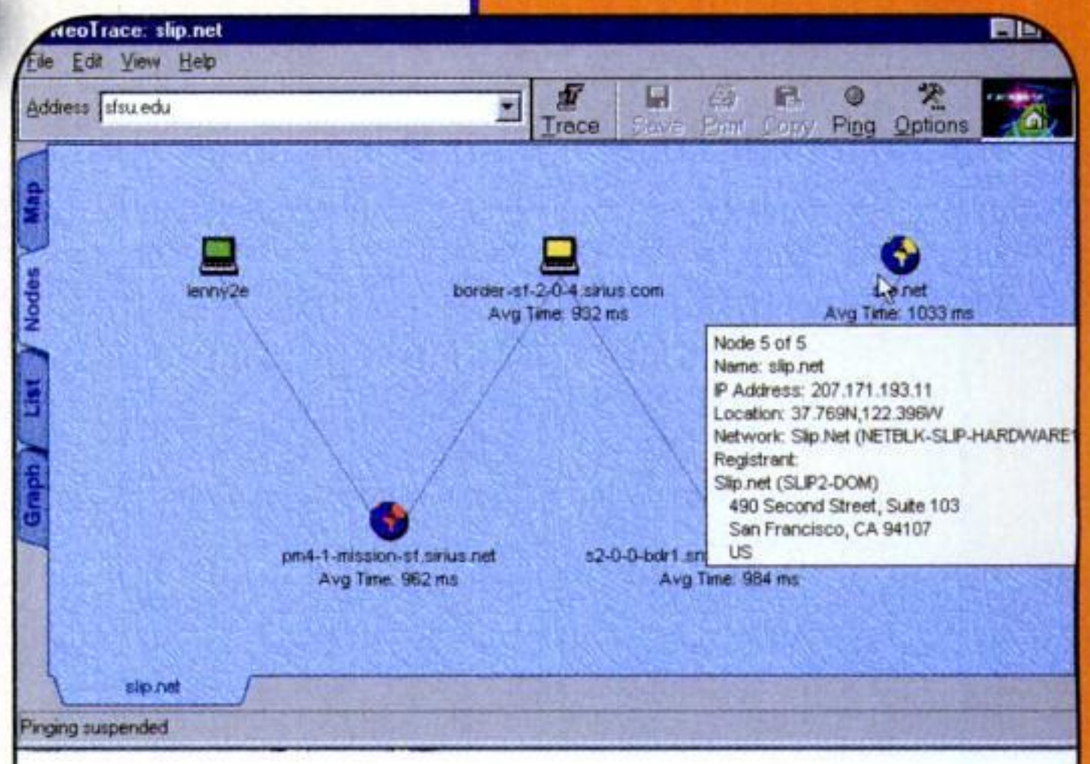
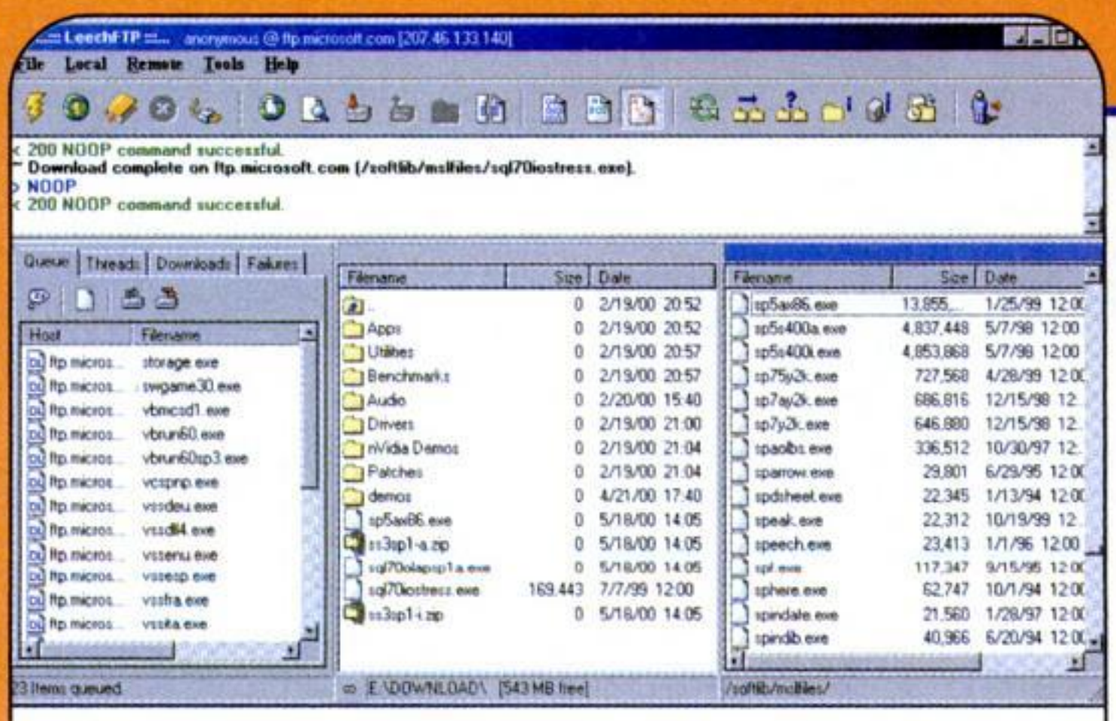
NeoTrace 2.12a

When network and Internet connections go bad, *NeoTrace* lets you pinpoint the weak link in the TCP/IP chain. By adding a graphic interface to the traditional Trace Route and Ping tools, *NeoTrace* allows you to literally follow TCP/IP packets all over the globe. When you ping an Internet address, the Map tab shows packet routes across a global political map of cities, states, and countries. The Node tab graphically displays the specific hops along the packet's trail, with the average times it takes to reach each node. Point to a node and a popup text window displays more specific information, including a domain name, IP address, domain registrant, and street address—just what you need to hunt down persistent spammers or pinpoint bottlenecks on a LAN or WAN.



With a simple graphic interface, *NeoTrace* makes it easy to track the TCP/IP packet routes that comprise your Internet connection, allowing you to isolate and identify any connection problems.

$30; Neoworx;
www.neoworx.com/goonline/ntcurs.asp



LeechFTP's job queue, smart download resume, and multithreaded file transfers make it a power-user's delight, but its highly customizable connection settings can turn it into an FTP site's worst nightmare.

LeechFTP 1.3

The file-grabbing client of choice for hardcore download junkies, *LeechFTP* has an interface that lets you receive up to 16 files simultaneously from FTP or HTTP-based sites. While files are downloading, you can log into and browse new sites through a customized Bookmark directory, and add files to your download queues. If you're disconnected in the middle of a file transfer, *Leech* will automatically attempt to reconnect and resume downloading. You can save and load multiple file lists and interactively bump the order of files up and down in the download queue. The URL-snatcher automatically adds filelinks to the download queue when you right-click on them in a web browser and choose Copy.

LeechFTP can act as a "demon-dialer"—attempting to connect with an FTP site ad infinitum until it's successful—or a well-behaved application, depending on the way you configure its Connect preferences. You can vary the time between login retries, or alter the amount of idle time before disconnection for each site profile in your Bookmark list—which, by the way, can be password-protected. *LeechFTP* is, in fact, so efficacious, some hobbyist FTP sites with limited bandwidth warn users to tone down *LeechFTP's* capabilities. For example, you may be told to limit the program to single-thread downloads and 60-second connection retries before attempting a login.

Free; Jan Debis;
stud.fh-heilbronn.de/~jdebis/leechftp

WS_FTP95 LE

Ipswitch Communications has stopped manufacturing free versions of its popular *WS_FTP* client application, but *WS_FTP95 LE* (light edition) is still available on Ipswitch's FTP site, and it's free to students and home users. *WS_FTP* isn't a war-game file downloader like *LeechFTP*, but it's an invaluable aid for quick-and-dirty web site maintenance. The dual-pane interface makes it easy to send files back and forth between local and remote directories. Even better, you can right-click on an HTML file in a remote web directory listing, choose Edit to open it in your favorite text editor, and make quick tweaks into tags and text. When you close the window, the modified file is automatically saved and uploaded to your web site.

Free; Ipswitch Communications;
ftp1.ipswitch.com/pub/win32/ws_ftple.exe

BOINK!

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hitting your monitor after you find out
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pages faster, easier, and cheaper if
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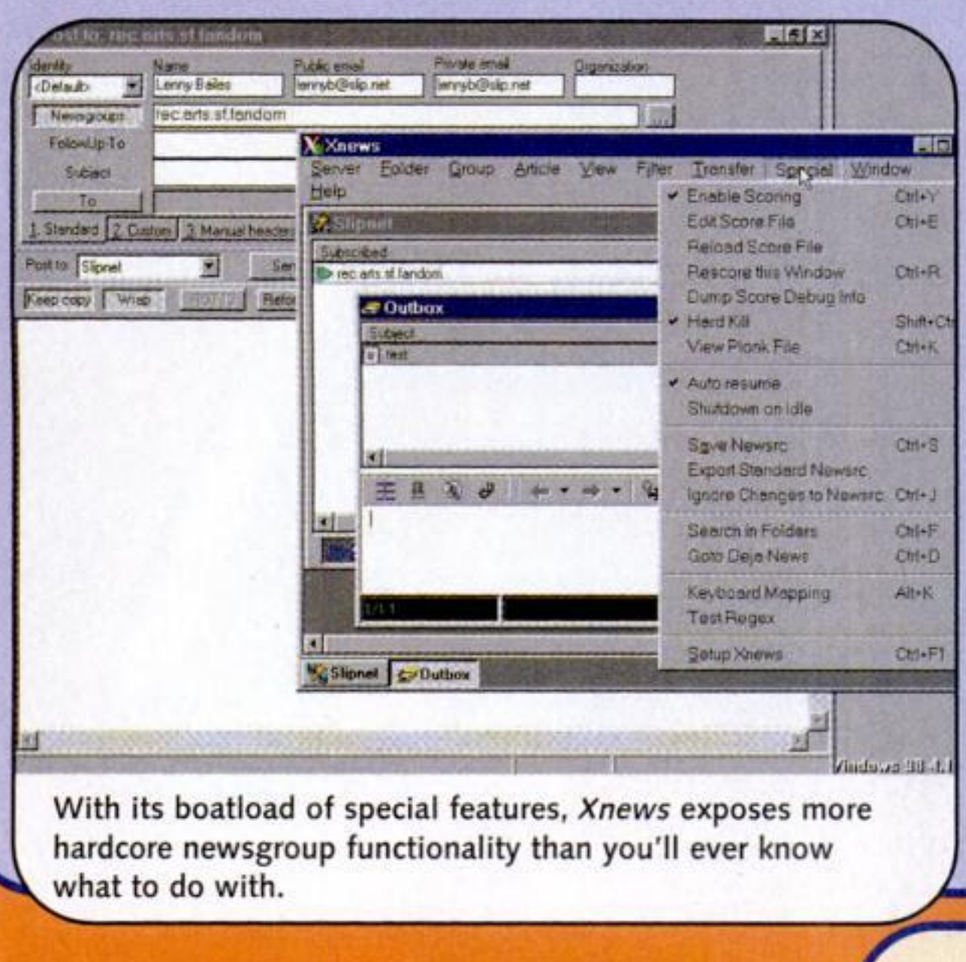
Xnews and Free Agent

Hardcore participants in Usenet newsgroups consider the slim, functional *Xnews* newsreader to be the cream of the crop—at least as far as Windows is concerned. Command-line arguments let you start *Xnews* in multiple server configurations. Its easy-to-use interface makes it a no-brainer to find individual newsgroups, and to thread, unthread, and archive incoming messages (or your own replies) and store them in a series of folders. You can also post to multiple news servers, assemble and decode binary files with a single keystroke, and create message-header queues for delayed retrieval. *Xnews* supports all known Usenet headers and lets you add your own custom X-headers. It also includes a 1000-point scoring system, so you can set up reading filters for browsed messages and groups, or create a Plonk (killfile) feature.

About the only thing *Xnews* can't do is log in and automatically retrieve selected newsgroups for offline browsing. To do that, you need Forte's *Free Agent* newsreader. We're not fond of the *Free Agent* user interface—it lacks the custom header capability, archive management, message scoring, and killfile features that *Xnews* offers (and that Usenet junkies love so much). *Agent's* saving grace is that it allows people with pay per-minute (or per-hour) Internet providers to automatically dial in, retrieve text and/or binaries in selected message ranges, and hang up. You can read and reply to messages offline, and schedule quick upload/download runs at your own convenience.



With its boatload of special features, *Xnews* exposes more hardcore newsgroup functionality than you'll ever know what to do with.

Xnews: Free; Luu Tran; xnews.3dnews.net.

Free Agent: Free; Forte; www.forteinc.com

EasySeeker

If you want to perform power-searches on the web, Blue Squirrel's *EasySeeker* is the right tool for the right price. *EasySeeker* can submit simultaneous search queries to 100 general and specialized Internet knowledge bases. It automatically removes duplicate results, and the cumulative search index can be saved in HTML or X-Base database formats. Unlike competitors, such as *WebFerret*, *EasySeeker* can auto-download retrieved web pages to your hard disk, then index them. Users can select from three search types: InstantFind search takes the least time and disk space. CleanFind takes a bit longer, but it eliminates duplicate URLs and entries that yield a "404 site-not-found" message. FilterFind can take considerably more time than the other two search options, but it's potentially the most useful, retrieving each physical page listed in the search results (minus embedded images, sounds, and applets) and organizing the results on your hard disk with a complete HTML index page. The results can be further refined through Boolean keyword queries, so you can grab all web pages containing your name, then query and read the results offline in your copious spare time.

Free (or pay $20 version for a version without banner ads); Blue Squirrel; www.bluesquirrel.com/products/easyseeker/easyseeker.html

Motherboard Monitor

If you're a PC hotrodder who overclocks CPUs or runs the latest 800MHz-plus screamers from Intel or AMD, *Motherboard Monitor* may save you from a meltdown. A simple system tray TSR, it works directly with modern motherboards to display the temperature of the CPU, and monitor the core voltage of the CPU, system bus, and system fans. Use it to set maximum temperature and voltage thresholds that will trigger a visual or audible alarm when the PC gets too hot. The program includes plugin support for *CPUIdle* (**www.bugcomputer.com/cpuidle/index.html**) and *Shutdown Now!* (**www.dworld.de**), two shareware programs that sound an alarm if the CPU temperature or voltage exceed your thresholds. *CPUIdle* issues HLT instructions to a CPU running Windows 9x, telling it to slow down and save power. *Shutdown Now!* can force a PC running Windows 9x or Windows NT to reboot, or to turn itself off when things get too hot.

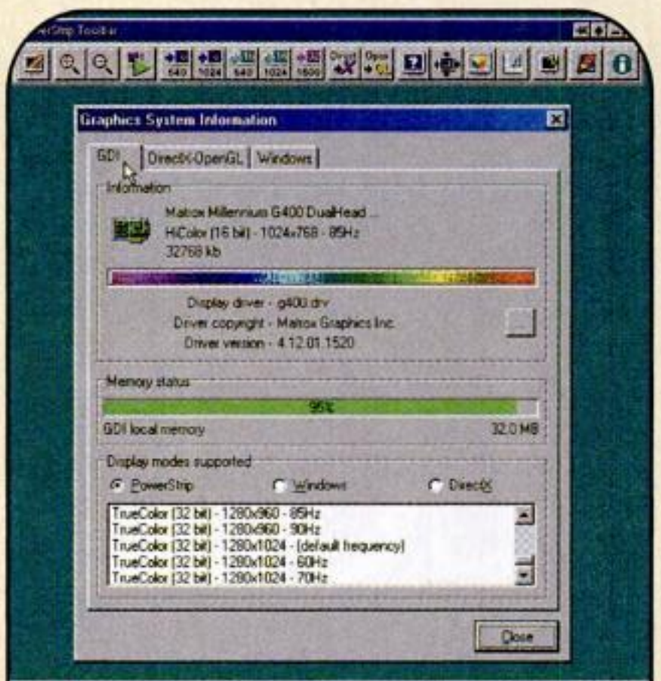
Like the power meter on the side of you house, *Motherboard Monitor*'s gauges and dials fill you in on what exactly is going on with your mobo.

Free; Alex Van Kaam; www.hatman.com/mbm/mbm.htm

Powerstrip 2.6

If you don't like the custom display controls that come with your graphics card and monitor—or if the vendor didn't supply any—get a copy of *Powerstrip* for your workbench. It's a power user's diagnostic and control utility that handles all things video. We use it to bump our adapter/monitor display combination to pixel resolutions and vertical refresh rates that aren't defined by the manufacturers. If you're a gamer, you'll appreciate the diagnostics that confirm whether the 2x/4x mode on your AGP videocard has kicked in, the option to toggle the card's performance settings, and the ability to change color palettes from normal Windows defaults to optimized DVD, DirectX, or Open GL settings. You'll also like being able to bump up the clock speed of your videocard's graphics processor and memory.

If your monitor's performance is limited by a missing driver profile, *Powerstrip* can automatically detect the manufacturer and model number and coordinate it with your videocard. Rather than choosing between two or three fixed defaults in the Screen Area and Adapter Refresh Rate settings, you can try any combination you choose and see whether the hardware will support it. If you're into graphic design, you won't need a third-party utility like *Colorific* to calibrate your monitor's gamma correction; *Powerstrip* lets you define keystroke macros that quickly switch the screen between preset or manually configured gamma, RGB, and CYMK color values. It also adds a complete set of power management controls to the non plug-and-play Windows NT 4 operating system.



Using *Powerstrip*, you have access to every tweakable setting possible in the Windows GDI, DirectX, and the videocard's drivers.

$30; Entech Taiwan; www.entechtaiwan.com

Quick Record and Acid Wave

Looking for a way to do quick-and-dirty WAV captures? The Sound Recorder utility built into Windows 95/98 will conk out on you after approximately one minute of recording time. For recording line-in sound from a VCR/CD/cassette player, or recapturing music files in other formats on your hard disk, *Quick Record* fills the bill. It looks like Sound Recorder, but will keep running and recording at up to 192kbps for as long as you have enough memory and hard disk space. If you're a serious home musician, you may want to check out *Acid Wave*, a more complex WAV recorder/editor that doubles as a synthetic music studio. Use it to cut, paste, and mix sound files; adjust frequency and amplitude; stretch or reverse a recording; and add special effects such as vibrato, flanging, and choral echo.

Quick Record: $30; M.J. Saxon; www.msaxon.com/quickrecord

Acid Wave: $45; Polyhedric Software; www.polyhedric.com/software/acid/

Right-Click MP3

This convenient, free utility provides a quick, painless right-click menu that enables bulk conversions of Microsoft WAV files to MP3 files, and vice-versa, at up to a 320kbps bitrate. As an added bonus, you can free up hard disk space by automatically deleting the source WAV files after the conversion to MP3 is completed. *Right-Click MP3* includes a free MP3 encoder, but it also supports third-party plugin encoders. If you spring for Xing's (**www.XingTech.com**) $20 MP3 encoder, you can do your MP3-to-WAV conversions with a variable bitrate, which produces smaller files with no loss of sound quality.

Free; Mr. Shannon; www.execpc.com/MrShannon/rc-mp3

EasyCrypto 2000 and Secret Mail

"Bullet-proof" encryption algorithms, once thought to be impregnable, have become grist for business-section headlines. Within minutes, skilled hackers can compromise the RSA and DES-encryption schemes used by the National Security Agency.

TopStudio's *EasyCrypto 2000* is a convenient file encryption utility for Windows 95/98/NT4 that uses the less-crackable 128-bit Blowfish encoding algorithm. To protect the security of your data, *EasyCrypto 2000* offers convenient Windows Explorer right-click extensions. Password-protect a file or folder, and it becomes unreadable until you right-click it again and re-enter the password. *EasyCrypto* also lets you quickly create self-extracting encrypted ZIP archives. *Secret Mail*, a companion application from Top Studio, is a pared-down e-mail client that can transmit and receive encrypted messages (plus file attachments) through SMTP/POP3 mail or a private LAN. (For POP3 mail, *Secret Mail* can be used as an extension to a full-featured client, such as *Eudora* or Microsoft *Outlook/Outlook Express*.)

EasyCrypto 2000: $30; SecretMail: $59; Top Studio; www.topstudio.com

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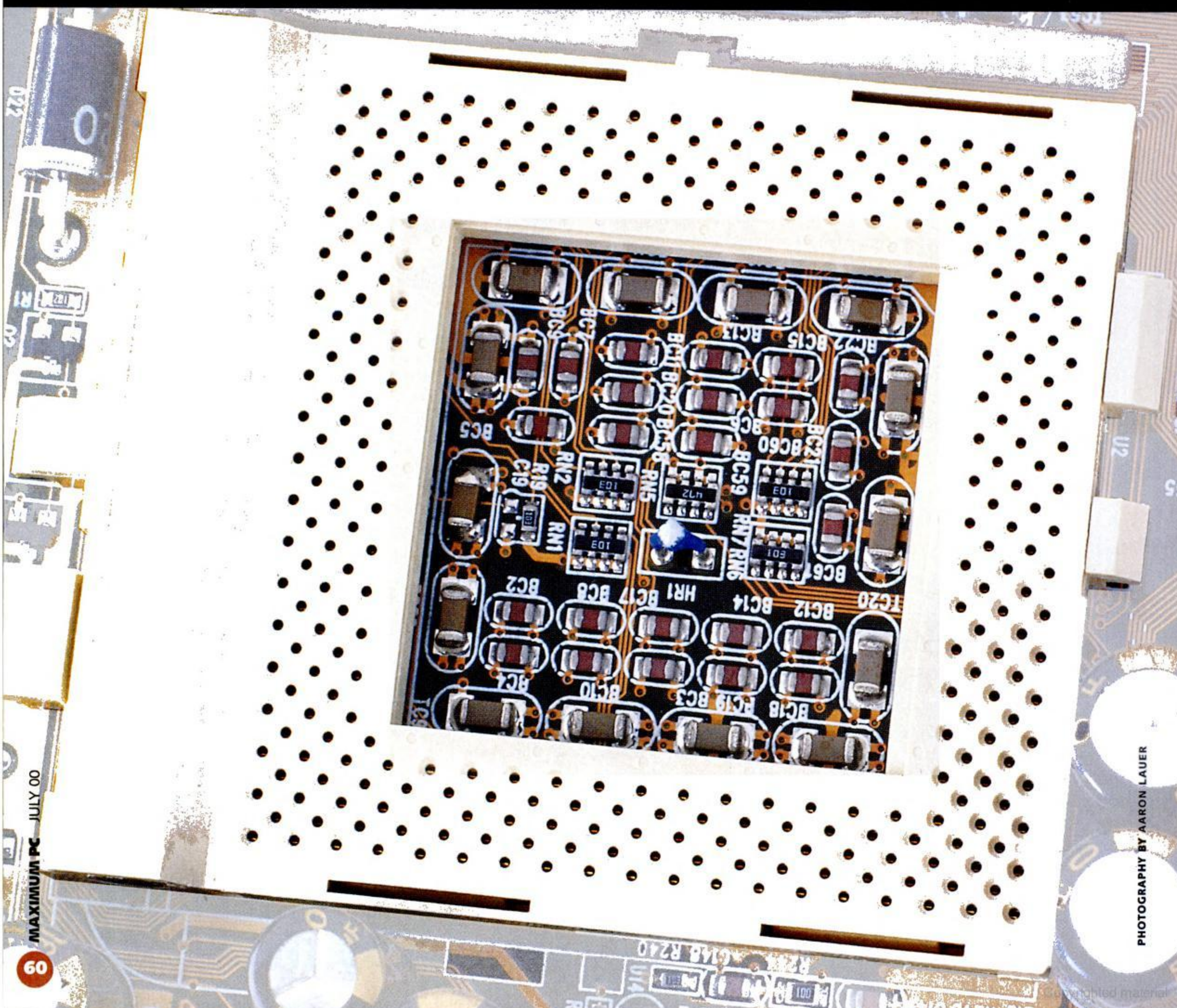
The Maximum PC Council on Motherboard Standards Presents...

YOUR FIELD GUIDE TO SLOTS, SOCKETS, AND SLOCKETS



PHOTOGRAPHY BY AARON LAUER

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by Gordon Mah Ung

Deep within the lush green circuitry of the world's motherboards lie the true predators of the computing world: CPU interfaces. These rarely seen and little respected connectors provide a habitat on your motherboard for the CPU, and they can make or break your upgrading adventures. Take, for example, AMD's planned extinction of the Slot A processor interface: New Thunderbird-class Athlons will only fit in sockets, so your Slot A motherboard will be rendered as irrelevant as the dodo.

In the early history of PCs, most CPUs grazed peacefully on the motherboard savannah. CPUs from Intel, AMD, and even Cyrix all drank from the same Socket 7 rivers—but that all changed when a beast known as Socket 8 emerged from the jungle. Tied to the Pentium Pro and its P6 architecture, Socket 8 would not house any Socket 7 CPUs.

Ultimately, Socket 8 was just an evolutionary anomaly. Because Pentium Pros were terribly expensive to produce, their numbers never hit critical mass. The true king of the jungle arrived in 1997—the Slot 1 connector, which accepted the bold new Pentium II. From then on, there would be no peace in the jungle.

As herds of Slot 1 CPUs and motherboards overran the landscape, Intel was accused of purposely nurturing the proprietary connector in order to smother its competitors. But Intel says it had to make the change to stay on top of technology, and that Slot 1 was a matter of pure evolution.

When you think of a CPU, don't think about its fancy plastic or ceramic packaging. Instead, consider the thumbnail-sized die that sits inside it. As chip engineers say, it's the die that drives the packaging, the pins or connectors, and the bus. Adding new features to a die may require adding more voltage and ground lines, as well as pins or connectors to support the features. Could Intel have implemented the Pentium II and P6 bus in Socket 7? No way, the company insists. Among sundry other reasons, Intel couldn't fit 512K of L2 cache on the CPU die itself, so it threw the CPU die and its complementary L2 cache onto a common daughtercard. Thus was born the oblong slot.

Intel may be vindicated by history. Even after Slot 1 became a de facto standard, AMD introduced its own proprietary slot—Slot A for Athlon. Consider that AMD was one of the most staunch supporters of Socket 7 when Intel introduced its controversial slot, and that even today, AMD still ships plenty of K6-2 CPUs for Socket 7 duty. But like Intel, AMD feels it was forced to adopt an interface for the future. The hard truth is that Socket 7 was simply has-been technology.

Technological Darwinism is cruel, of course, and we'll soon see the once-proud slot face extinction as L2 cache is moved back to the CPU die (a process made by possible by improved process technologies). Intel will put Slot 1 to pasture in favor of socketed P-IIIs in Socket 370 mobos, and will also introduce a Socket 423 connector for its new Willamette CPU, ultimately rendering the P-III, in both Socket 370 and Slot 1 species, extinct. This year, we'll also see the new Socket A, AMD's replacement for Slot A, which will soon be but a footnote in the annals of PC evolution.

For now, we give you a field guide to today's mobo-bound fauna. Some thrive, and some face dwindling population counts, but each is exotic in its own special way.

For definitions of Terminator words, check out the Terminator online at www.maximumpc.com.

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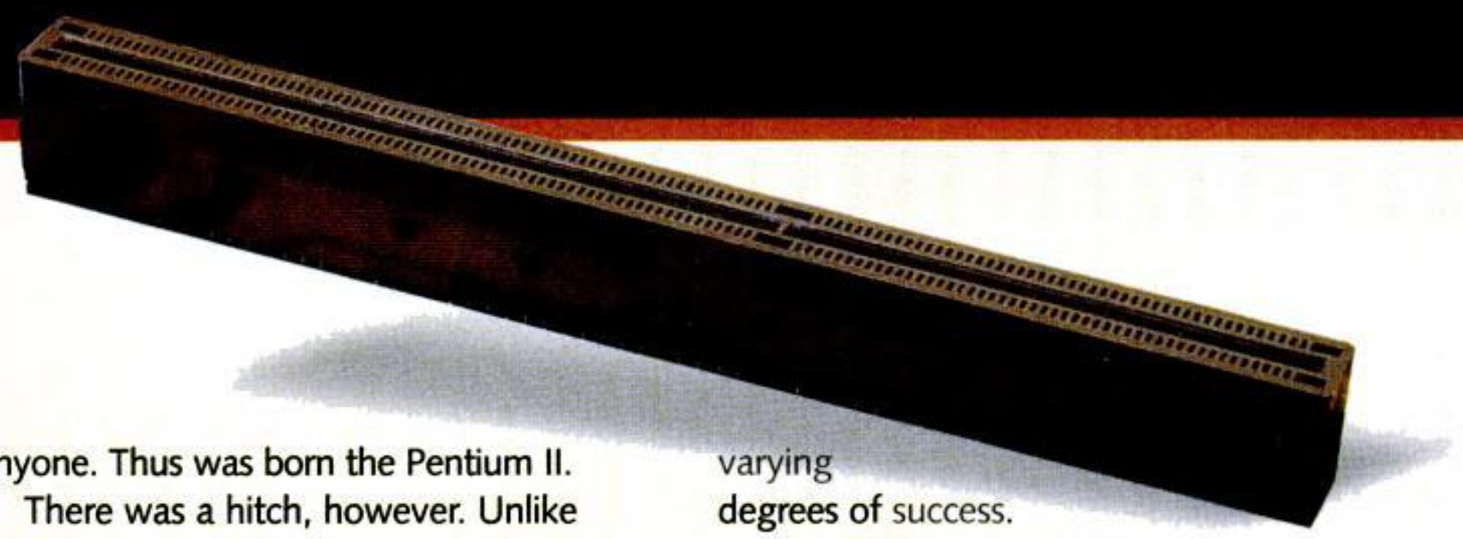
SLOT 1



First Sighted: May 1997
Connections: 242
Supports: Pentium II, Pentium III, Celeron, and Pentium Pro (with converter card)

No safari is complete until you've bagged your first Slot 1 motherboard. First sighted more than three years ago, Slot 1 marked what was to be a massive upset in the wild kingdom's food chain. Previously, all connectors co-existed peacefully, but for the Pentium Pro/Socket 8 aberration.

To understand the breeding of Slot 1, you must understand the history of Intel processors. Intel's P6 CPU architecture—which still survives in today's P-IIIs—first arrived in the Pentium Pro. Sure enough, the Pentium Pro offered state-of-the-art performance, but it suffered an evolutionary defect: While its integrated, on-chip cache ran at full-speed (and was therefore superior to later CPUs' half-speed L2 cache), it also made the CPU relatively expensive to manufacture. So in order to mainstream its new P6 architecture, Intel took the Pentium Pro core, removed its integrated L2 cache, and moved to a "closely coupled" L2 cache design, using 512K of generic SRAM that it could buy from almost anyone. Thus was born the Pentium II.

There was a hitch, however. Unlike the Pentium Pro's on-die cache, the P-II's closely coupled cache was incapable of running at full core-processor speed. This wasn't good. The new external cache needed to run quickly in order for the CPU to fulfill the promise of the P6 architecture, and it certainly couldn't run as slow as the 66MHz L2 cache sitting on Socket 7 boards. The solution was simple: Pair up the cache and CPU on a small daughtercard, and flip it vertically. The result was the Single Edge Contact Cartridge (SECC).

Because it stands erect, the SECC conserves valuable motherboard real estate, and allows for lower density L2 cache chips on *both* faces of the daughtercard, at speeds from 116MHz to 300MHz. Early Pentium IIs did in fact use both sides of the daughtercard for cache placement, but as cache densities increased, Intel was able to mount chips on only one side.

Slot 1's main weakness has been wanderlust. Too often, Slot 1 systems have failed to boot because the processor popped out during shipping. Intel, OEMs, and motherboard vendors have, over the years, created dozens of Rube Goldberg devices designed to keep the CPU strapped into the slot, with varying degrees of success.

The Slot 1 connector has survived all iterations of the P-II, P-III, and slotted Celeron. But now, the venerable Slot 1 is seeing its final days. When Intel shrank the core of the Pentium III to a 0.18-micron process last December, it was able to integrate L2 cache directly into the CPU die. With no need for daughtercards, Intel plans to retire Slot 1 in favor of Socket 370, to save money. Ironically, Intel first switched to modules in order to save money on cache. Now the company finds itself forced to switch back to sockets, in order to save money on modules.

Is Slot 1 now extinct? Not quite. Slot 1 boards will continue to serve hobbyists who are willing to plug Socket 370 CPUs into "slocket" converter cards. Intel also says it will offer Slot 1 P-IIIs until demand diminishes—just keep in mind that the company said the same about Slot 1 Celerons, then eliminated the Slot 1 packaging within months.

Thousands of years from now, when archeologists are exhuming the remains of the 21st century, they'll find the bones of Slot 1 motherboards. Hopefully, they'll realize just how significant the slot really was.

SOCKET 8

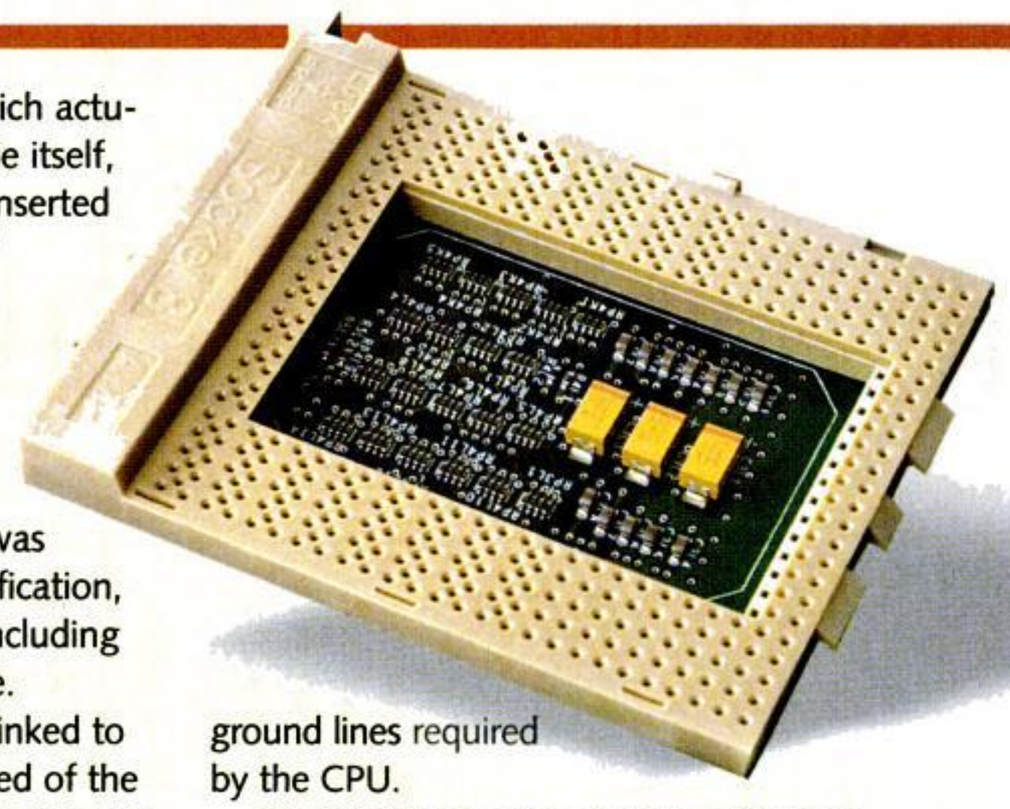
First Sighted: November 1995
Pins: 387
Supports: Pentium Pro, Pentium III OverDrive

Like the ape that first discovered tools in the opening scenes of *2001: A Space Odyssey*, Socket 8 and its partner, the Pentium Pro, trumpeted a massive evolution in the PC landscape. History reminds us that the P-Pro was actually Intel's sixth-generation processor, and employed a combination of CISC and RISC techniques. The P-Pro was highly optimized for 32-bit code, but blew chunks on 16-bit code. Because Windows 95 made extensive use of 16-bit code, the Pentium Pro never saw a warm reception outside Windows NT circles.

The P-Pro was also Intel's first attempt to integrate L2 cache with the CPU. Unlike the modern Coppermine P-III, which actually puts L2 cache into the CPU die itself, the P-Pro called for the L2 to be inserted into a "dual-cavity pin grid array" package. Essentially, the package featured two holes: one for the processor die, one for the L2 cache. Unfortunately, the cache had to be wired into the package *before* the package was certified, so if the CPU failed certification, the entire package was tossed—including the perfectly good L2 cache inside.

Because the L2 was so closely linked to the processor, it ran at the full speed of the core. To handle the full-speed L2, Intel gave the P6 bus independent front and backside buses—one for the L2 cache, and one for the system bus. The P6 bus could also handle multiple CPUs, and much more bandwidth than the Socket 7 infrastructure.

Physically, the 387-pin Socket 8 dwarfed all previous x86 interfaces. The pin count was mandated by the amount of cache aboard the Pentium Pro and the voltage and ground lines required by the CPU.



Though Slot 1 connectors would rule in the desktop jungle, the Pentium Pro, with up to 1MB of full-speed L2 cache, continued to be the choice for servers. Socket 8 and the P-Pro reigned until the even more monstrous P-II Xeon was created to fit in Slot 2. Despite surviving in computing oddities such as the supercomputer at Sandia National Lab—which uses 9,200 Pentium Pros—Socket 8 is now a severely endangered species.

For definitions of Terminator words, check out the Terminator online at www.maximumpc.com.
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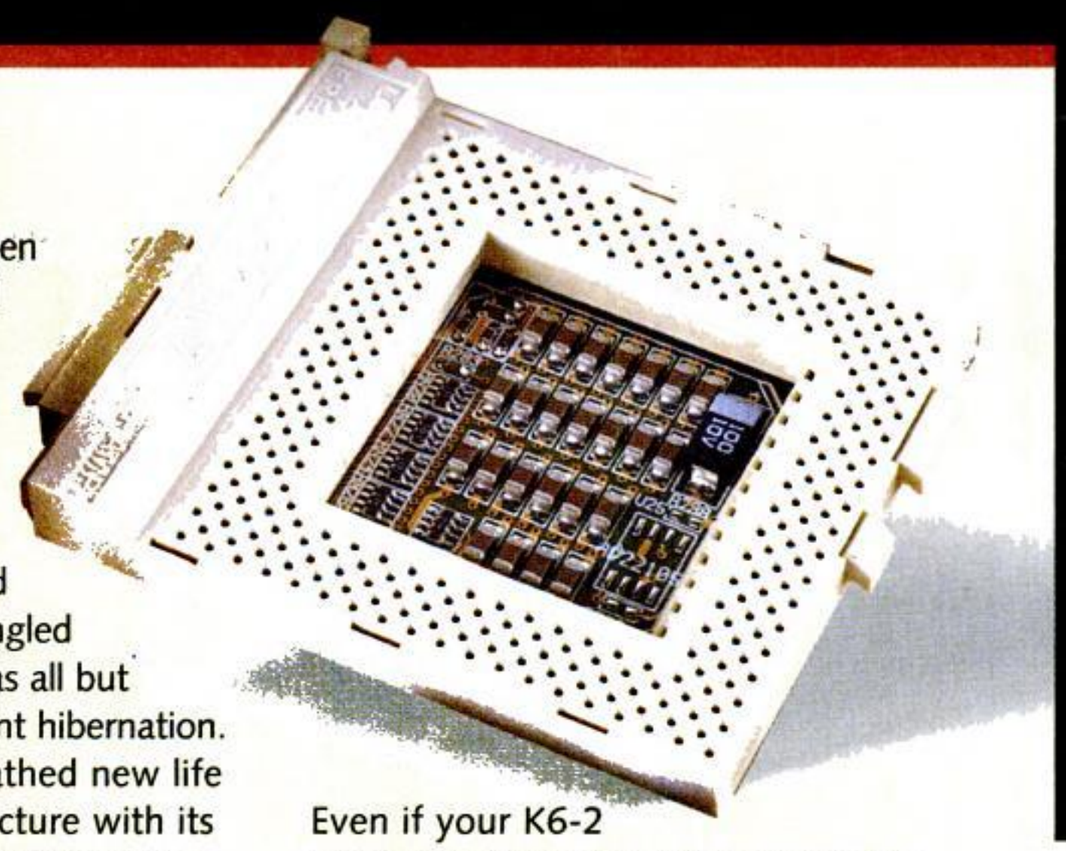
SOCKET 7

First Sighted: Late 1995
Pins: 296
Supports: Pentium Pentium MMX, K5, K6, K6-2, K6-III, Cyrix MII, 6x86, IDT WinChip

In this age of 1GHz CPUs, 75GB hard drives, and gigatexel-fill-rate videocards, you would expect the lowly Socket 7 to be extinct. It ain't so. Like an odd half-bird, half-mammal aberration, this sucker just won't die. Most likely, when Slot 1 and Slot A are both a distant memory, Socket 7 will continue to draw fresh air.

Intel mandated the Socket 7 with the 150MHz and 166MHz Pentium CPUs, and the rest of the PC industry quickly standardized around it. AMD's popular K6 and K6-2 both worked with Socket 7, as did CPUs from Cyrix and IDT. Because so many competing chips had found a home in Socket 7, conspiracy theorists believe that Intel's motives were rooted in upending the competition—not improving technology—when it introduced Socket 8. Intel officially abandoned the Socket 7 life raft with the introduction of its Pentium II. With features such as the Accelerated Graphics Port, 100MHz SDRAM, and ATA/33 tied to the new-fangled 440BX chipset, Socket 7 was all but expected to enter permanent hibernation.



Enter AMD, which breathed new life into the Socket 7 infrastructure with its Super 7 initiative. Super 7 updated the socket with AGP, 100MHz SDRAM, and ATA/33 support—features Intel said couldn't be added under Socket 7.

In retrospect, Intel may have been right on some points. Non-Intel Socket 7 chipsets proved to be chock full of bugs and hardware incompatibilities. One famous bug between Socket 7 and Intel's i740 graphics chips sparked numerous conspiracy theories. In the end, performance issues sealed Socket 7's fate. New Socket 7 boards constantly lagged behind Intel Slot 1 boards and chipsets. Some of this was due to architecture: Even if your K6-2 ran at 400MHz, the L2 continued to run at 100MHz—half that of a Pentium II with its dual independent busses.

The final nail in Super 7's coffin was AMD's decision to move to a proprietary Slot A solution for the Athlon. And even when AMD moves back to sockets for its high end, it will use a proprietary Socket A design, not Socket 7.

Yet somehow, Socket 7 survives today. AMD says it ships an incredible amount of Socket 7 CPUs every year, and will continue to do so. Because of its low cost, Socket 7 will likely lurk on the edges of the tundra for a while.

SOCKET 370

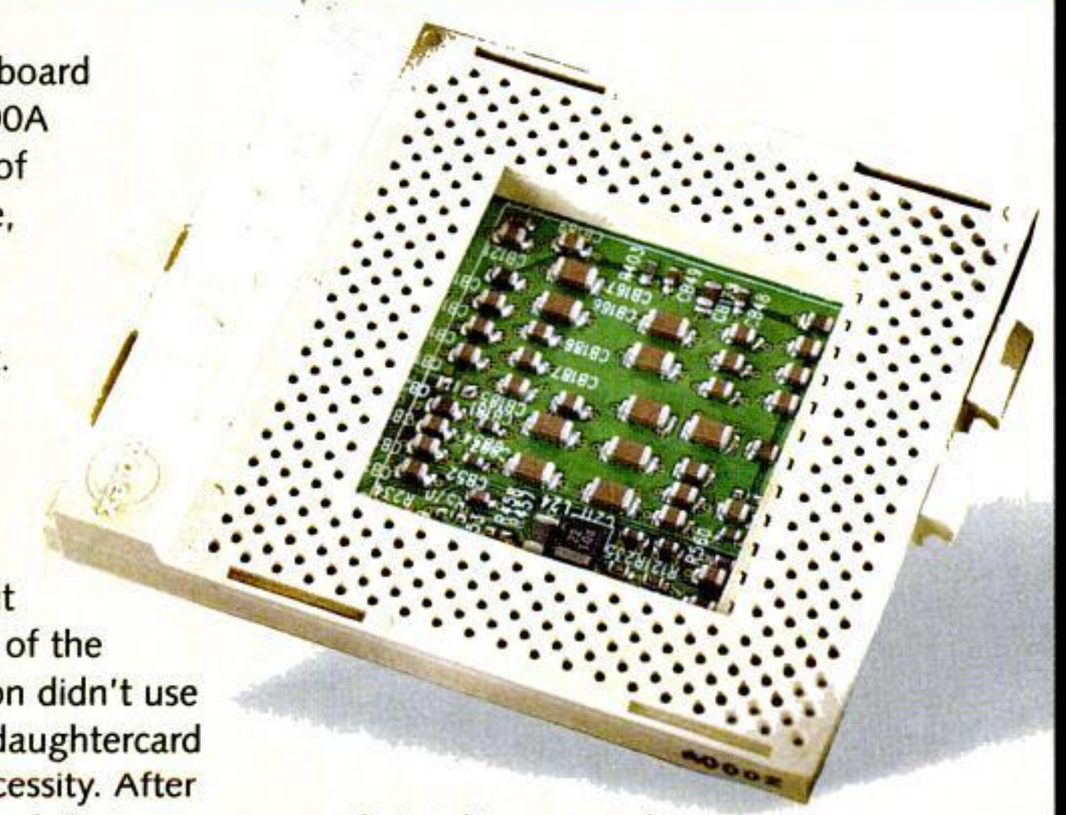
First Sighted: April 1999
Pins: 370
Supports: Celeron, Pentium III FC-PGA, VIA Cyrix III

When Intel announced it would create Socket 370 for its low-end Celeron, Socket 7 supporters cynically pointed to the move as proof that Slot 1 wasn't really necessary.

Intel's return to sockets was an unexpected side effect of the low-cost PC craze. In 1998, it became clear that the sub-$1,500 PC wasn't a fad. AMD's ultra-cheap Socket 7 K6-2 was the CPU of choice for bottom-feeder PCs, and it thrived. Intel needed to breed a CPU that could compete with the K6-2, but would leave Pentium II sales unscathed. The result was the 266MHz Celeron, released in April of 1998.

This breed of Celeron was basically a P-II stripped of all L2 cache. It was a dismal failure. Panned by both the press and public for poor performance, Intel went back to the drawing board and created the famous 300A Celeron. Featuring 128KB of full-speed, on-die L2 cache, the new Celeron quickly gained a reputation as an overclocking-friendly beast.

The first Celerons fit into Slot 1, but came in a Single Edge Processor Package—essentially a naked daughtercard without the fancy plastic packaging of the Pentium II. Since the Celeron didn't use any discrete L2 cache, the daughtercard was just an unfortunate necessity. After all, Slot 1 was the interface of choice in the Intel scheme of things, and some sort of slotted packaging had to fit into it. Eventually, however, economics prevailed, and with the introduction of the 466MHz Celeron, Intel officially returned to sockets—Socket 370 ties the CPU to essentially the same P6 bus that the Pentium II and Pentium III use.



In late 1999, Intel released its Coppermine Pentium III, which shed closely coupled L2 for on-die L2. Now, with no need whatsoever for daughtercards, Intel is expected to ease the world back to sockets. At press time, Intel was offering almost all of its fast Pentium IIIs in "Flip Chip Pin Grid Array" packaging. In flip-chip packaging, the CPU die is inverted on its host substrate. Besides assisting performance and reducing die production costs, this technique puts the die at the "top" of the packaging, where it's more exposed to fans and heatsinks.

Socket 370 will likely be Intel's mid- to low-end connector for the foreseeable future.

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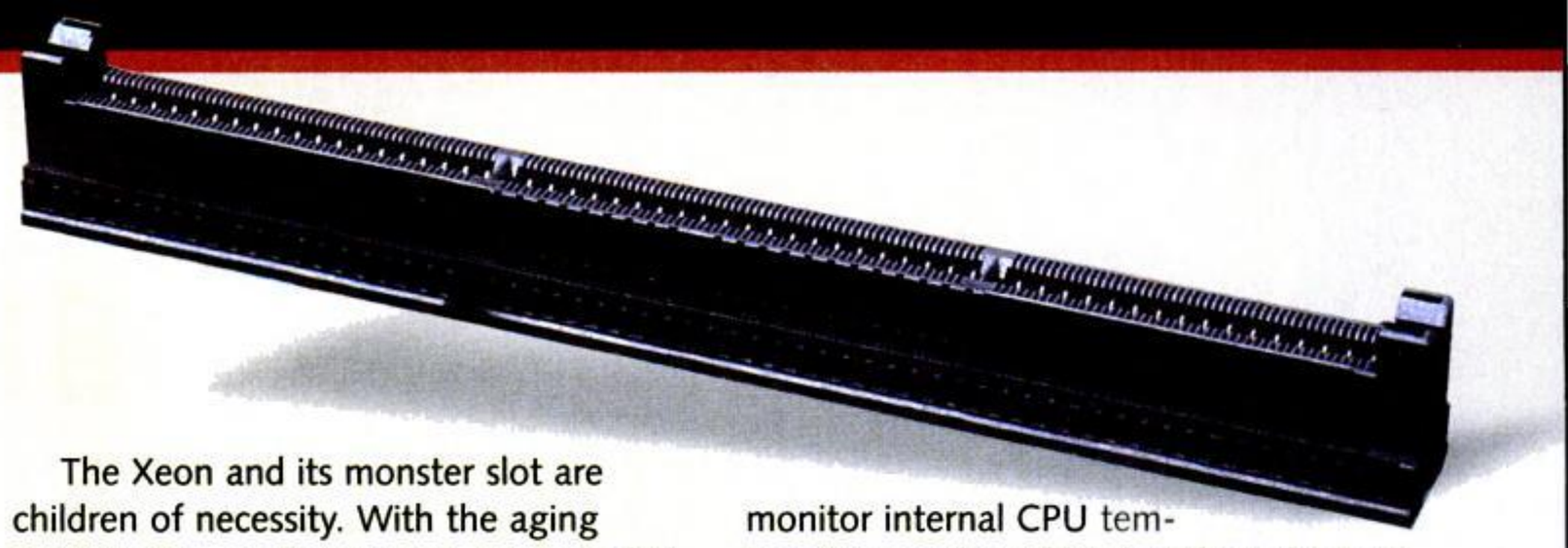
SLOT 2



First Sighted: June 1998
Connections: 330
Supports: Pentium II Xeon, Pentium III Xeon

Weighing in as the Brontosaurus of x86 processors, Intel's Pentium II Xeon (later updated to Pentium III Xeon) truly towers above all others. To support this beast, Intel minted the Slot 2 connector, which upped the total connections to 330. These additional leads support extra power and ground lines, and enable more CPU features. Slot 2 doesn't accept Slot 1 CPUs, and if you've ever seen the sheer size of the Slot 2 connector, you know why.

The Xeon and its monster slot are children of necessity. With the aging Pentium Pro on its way out, Intel needed to beef up the P-II for the server/workstation market. So, instead of relying on the slow generic cache chips found in P-IIs, Xeons use much more expensive L2 chips that support higher speed tolerances, and can therefore be clocked to full core processor speed. Because of its role as a server chip, Intel also needed to pack up to 2MB of L2 cache onboard. All this cache running at full-speed requires an immense amount of real estate and cooling, so instead of being wrapped in plastic, the Xeon is one big heatsink. Intel also built in features that let techies monitor internal CPU temperatures and quickly identify cache type.

Because their packaging is so heavy, Slot 2 CPUs are actually screwed down to the motherboard (this in lieu of the flaky retention systems employed by the Pentium II). The larger 330 connector allows Intel to design four- and eight-way server systems.

Like Slot 1, Slot 2's days are numbered. Codenamed Foster, the server version of Intel's new Willamette core will require a larger socket than its desktop counterpart. The extra real estate will go to—you guessed it—more L2 cache.

SLOT A

First Sighted: July 1999
Connections: 242
Supports: First-generation Athlon

Despite kicking and screaming when Intel introduced its proprietary Slot 1, AMD eventually executed an about-face and bred its own version of the slot, Slot A. Why? Because AMD knew that to increase clock frequencies, take advantage of plentiful generic SRAM, and keep its packaging reliable, it needed to move to a slotted system. With Slot A, AMD achieved those goals. Slot A Athlons feature 512K of L2 cache mounted on the same daughtercard as the CPU—just like Pentium II.

Did AMD eat crow when it switched over to slots? No, the company says. In fact, slots are inherently difficult to design motherboards around. With the oblong shape and additional juncture points of the connector and daughtercard, it's much more difficult to design reliable circuitry. If AMD could have jumped directly to 0.18-micron technology and integrated the L2 cache when the Athlon launched, it would have. But market conditions forced AMD to adopt a slot design while it waited for process technology to catch up.

Despite their electrical incompatibility, Slot A is physically identical to Slot 1. To make it easy for system builders to embrace the Athlon, AMD designed Slot A to be physically identical to Slot 1. Both use the same SC242 connector placed on the same area of the motherboard. OEMs could begin building Athlon boxes simply by switching motherboards and CPUs.

Remember, a CPU's connector is simply an expression of its underlying technology. To feed the red-hot Athlon, AMD licensed Digital Equipment Corporation's super-fast EV-6 bus. Originally developed for DEC's Alpha CPU, the EV-6 transfers data on both the rising and falling edges of a 100MHz clock, effectively doubling the data rates of most Pentium III systems.

Slot A hasn't escaped controversy, however. In a class-A screw-up between AMD and chipset maker VIA, Slot A boards using the new KX133 chipset are incompatible with the next generation of Athlons. Neither company took the blame for the error, but AMD does note that the Thunderbird will work with AMD's older 750 chipset.

The whole matter may be moot anyway—Slot A could have the shortest life span of any CPU connector. Backing off earlier pledges that it would support Slot A as long as people wanted it, AMD now says that it plans to sell slotted CPUs only to system manufacturers. The move effectively eliminates upgrade paths for those who bought Slot A motherboards in support of first-gen Athlons. AMD's motives are similar to Intel's: With daughtercards no longer a necessity, why prop up a dying species?

Socket A will feature 462 connectors and support the company's budget Duron CPU, the Thunderbird series of the Athlon, and the Mustang CPU, which is headed for the server market. AMD has standardized the 462-pin connector to ensure that it has a longer lifespan than Slot A.

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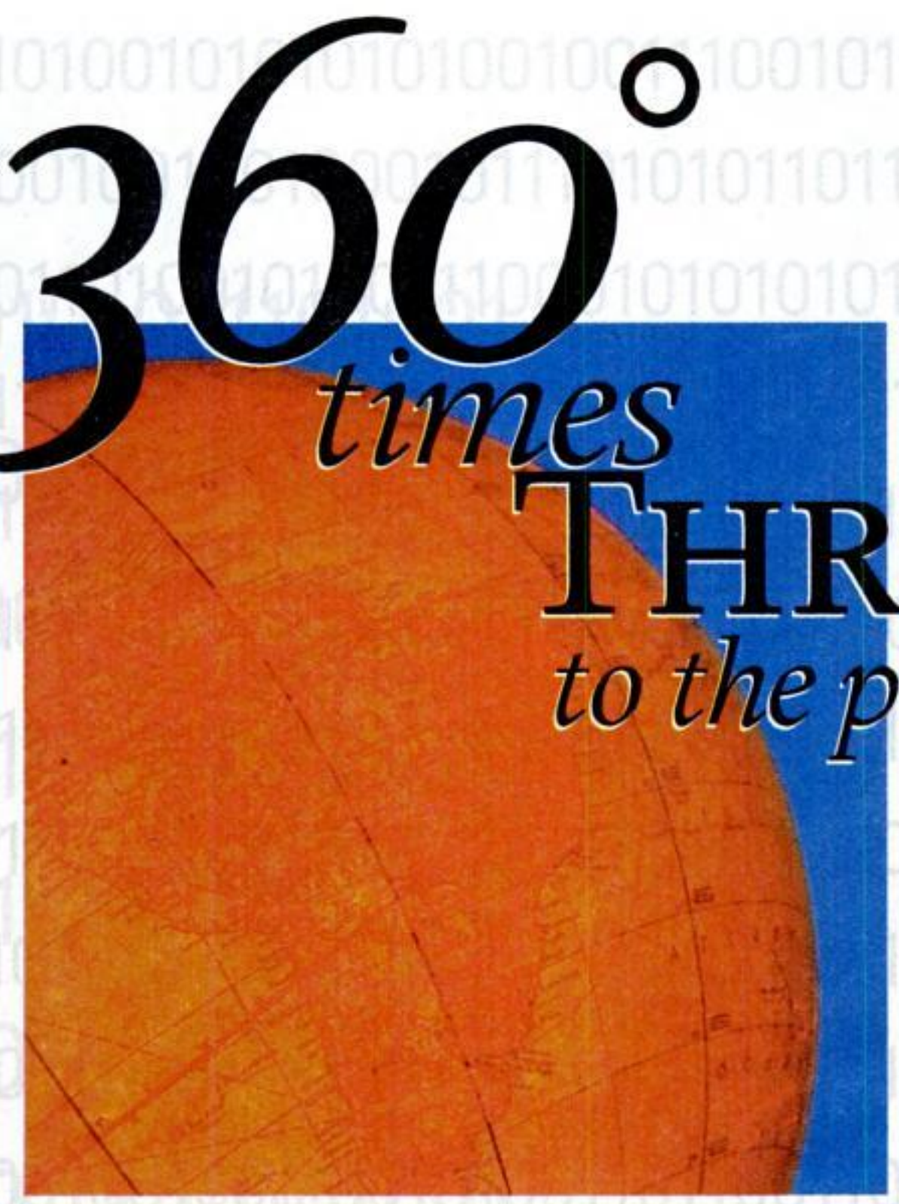

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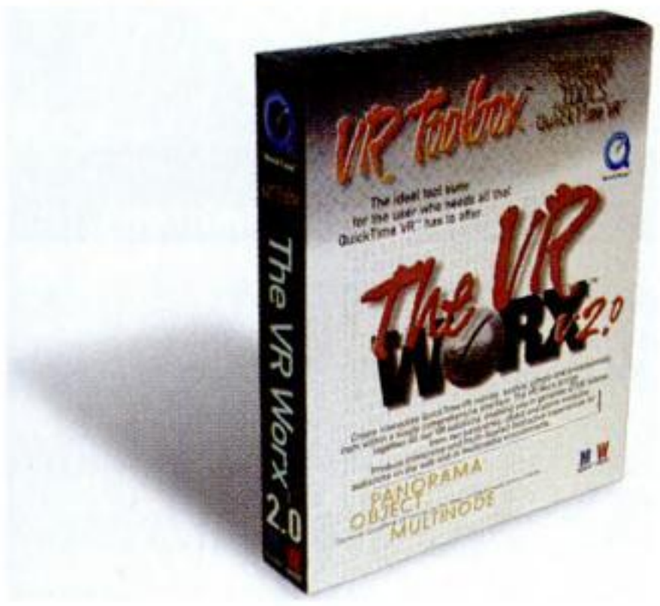

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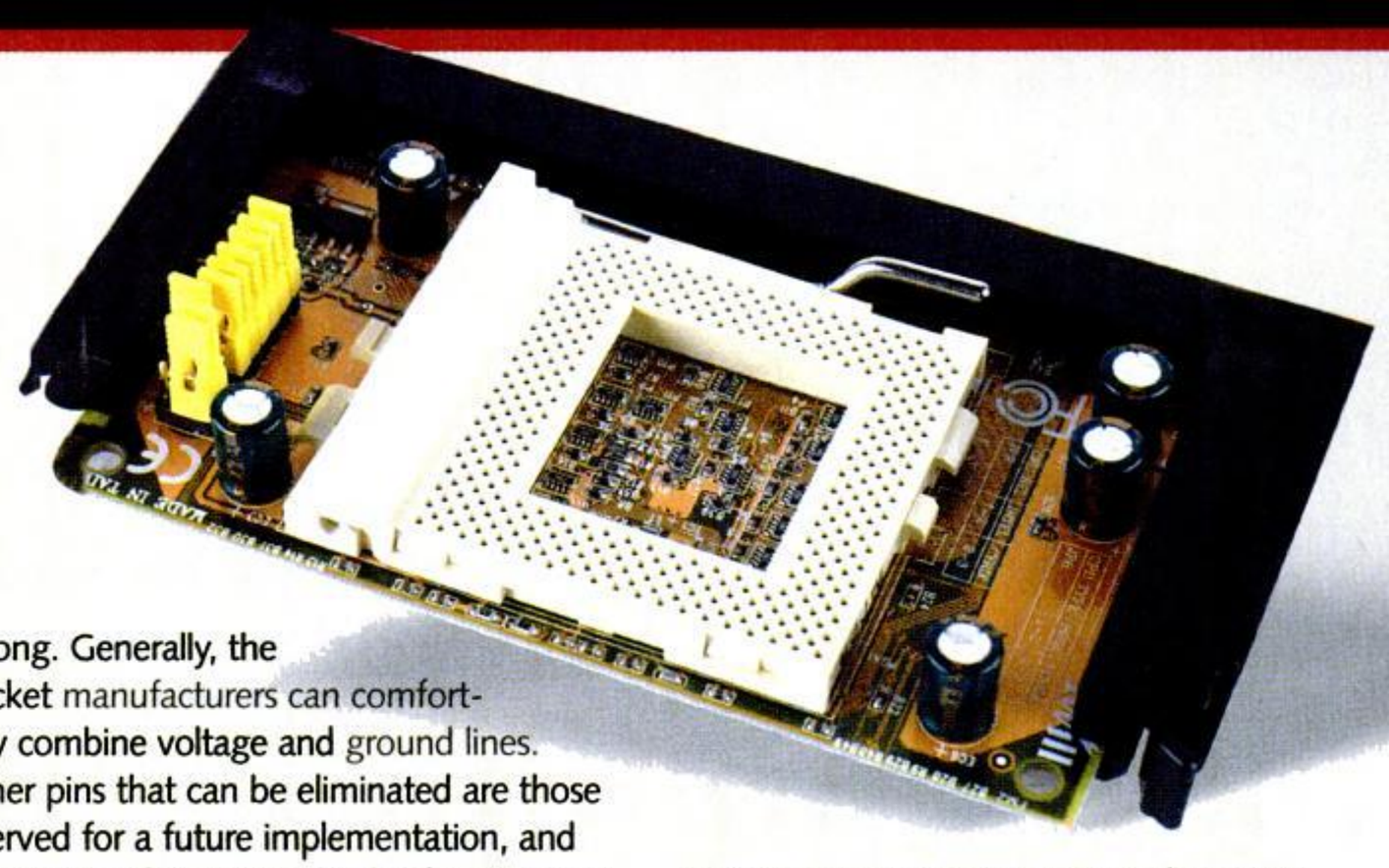
SLOCKETS

(AND OTHER ASSORTED FREAKS OF NATURE)

First Sighted: Dates vary
Pins: N/A
Supports: Thrifty system tweakers



You've probably marveled at these odd creatures on visits to your local carny. There's the amazing Socket 370 to Slot 1 adapter. Or the scary Slot 1 to Slot 2 device. Or the downright weird Socket 8 to Slot 2 converter.

Don't be frightened. These devices actually exist, and for the most part, they work. For a while, QDI even made a cross-breed that let you clip two Socket 370 Celerons into a daughtercard that slips into a Slot 1 (provided you use it with a QDI-built motherboard). Using crafty electronic workarounds and patches, these adapter devices let you place your square peg of a processor into that round hole of a motherboard connector.

So how do they condense the 370 pins of a Socket 370 CPU into the 242 connectors of a Slot 1? After all, each of those 370 pins carries electricity for some vital task, right?

Wrong. Generally, the Slocket manufacturers can comfortably combine voltage and ground lines. Other pins that can be eliminated are those reserved for a future implementation, and feature pins that aren't absolutely necessary.

After hearing of these mutants of nature, some PC conservationists wonder why an Athlon can't be grafted to Slot 1. Well, guess what? It'll never happen. Different bus technologies and signal limitations make such an operation a miracle that not even Scotty could pull off. In fact, because of the fast data rate of Athlon's 200MHz bus, AMD officials tell us they're encouraging vendors to abandon all plans of a slot-to-socket Thunderbird converter because of the errors it would induce.

When creating these freaks, crafty vendors can also add features. Take Iwill's Slocket II adapter pictured above; by crossing certain pins, the adapter enables SMP mode, so you can use two PPGA Celerons in a dual Slot 1 board, something Intel never intended its low-cost CPU to do. Adapters can also let you vary voltage and defeat overclocking limitations. For example, an upcoming Iwill Slocket will enable Slot 1 boards that don't allow Coppermine voltage to run the fastest Pentium IIIs available.

There are limitations, however. Computers rely on incredibly tight timing, and adding trace lengths to critical lines (not to mention combining voltage lines) can sometimes affect stability. For the most part, Slocket-type adapters have worked without problems and don't appear to impact performance.

SOCKET 5

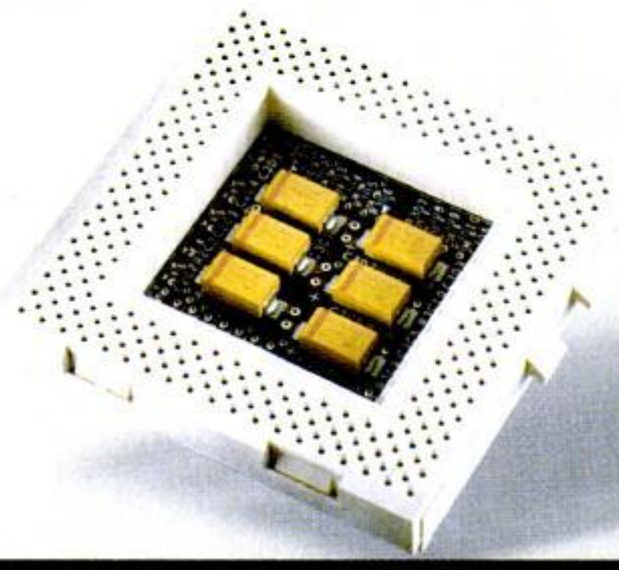
First Sighted: Jurassic times
Pins: 320
Supports: Pentium, K5

Socket 5 represents the bridge between the Jurassic period of computing and the modern era. Introduced with the 75MHz Pentium, the socket marks a step forward for PCs.

Intel originally introduced its fifth-generation processor, the newfangled Pentium, in a Socket 4. Originally running at 60MHz, the mother of all Pentiums was a bit squirrelly. It ate 5 volts of power, and gained notoriety for its infamous "FDIV Pentium bug."

Intel redesigned most of the chip and introduced higher-clocked versions in a new Socket 5 connector. With the Socket 5 version, Intel was able to drop the voltage to a more manageable 3.3 volts, which lowered the heat generated by the chip and improved reliability. Socket 5 was home for the Pentium until Intel introduced the 166MHz version, which mandated a Socket 7 connector.

For budding PC archeologists, we've included a chart of which interfaces handle which CPUs. Happy hunting, and remember: These are wild animals, and they're more scared of you than you are of them.



INTERFACES AT A GLANCE

INTERFACE	CPU	CONNECTORS
Socket 1	i486DX, DX2, DX4, etc.	169
Socket 2	i486, Pentium OverDrive	238
Socket 3	i486, Pentium OverDrive, AMD 5x86	237
Socket 4	Pentium 60, 66 and OverDrives	273
Socket 5	Pentium 75 to 133	320
Socket 6	486 class	235
Socket 7	Pentiums, K5, K6 and Cyrix CPUs.	321
Socket 8	Pentium Pro	387
Socket 370	Celeron, FC-PGA chips	370
Socket 1 "SC242"	Pentium II, Pentium III	242
Socket 2 "SC330"	Pentium II Xeon, Pentium III Xeon	330
Slot A	Classic Athlon	242
Socket A	Duron/Thunderbird Athlon	462
Socket W	Willamette/Pentium IV	423

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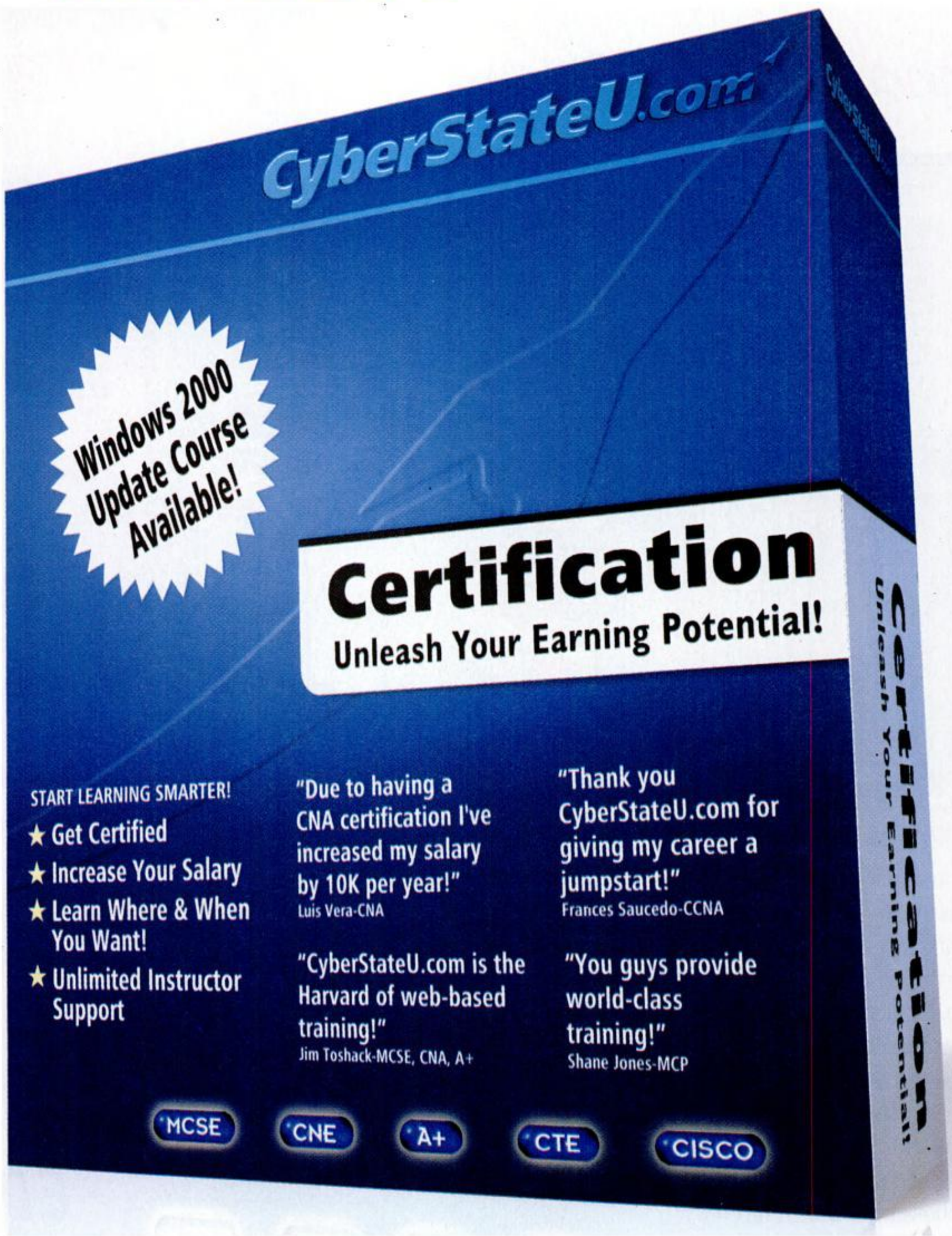

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Chipset Shop Talk

Choosing the right motherboard/chipset combo will get you a PC that's powerful now, and upgradeable later.

It used to be so simple.

Just one year ago, if you wanted to support your Pentium II/III or Celeron CPU, you got yourself an Intel 440BX chipset motherboard and felt confident that your mobo was a time-tested performer, long on value and short on bugs. But Intel's Coppermine CPUs arrived late last year, armed with a new bus speed and different voltage requirements. Suddenly, the BX didn't quite cut it anymore. Intel's 810 and 820 chipsets have stepped up as the BX's chosen successors, but their short lives have been plagued with compatibility issues and bugs. And now VIA, a longtime Intel competitor, has thrust forward a chipset option that seems to be perfect for the performance-minded.

What's a power-user to do?

We'll fill you in on just what a chipset does, and talk you through the strengths and weaknesses of each of the most popular motherboard chipsets currently available.

—Devin Charters

WHERE THE CHIPS FALL

Your motherboard's chipset is comprised of two chips: the northbridge and the southbridge.

On your motherboard's dataflow map, the northbridge chip sits pretty between the CPU and the system memory, on what is referred to as the frontside bus (FSB). Buses are the electrical pathways through which your machine's internal components communicate with one another. A bus' capacity is determined by multiplying its width (measured in bits) by its speed (measured in MHz). The faster and wider the bus is, the more quickly it can shunt data from point A to point B. (See "How Data Moves Around Your Motherboard," October 1999.)

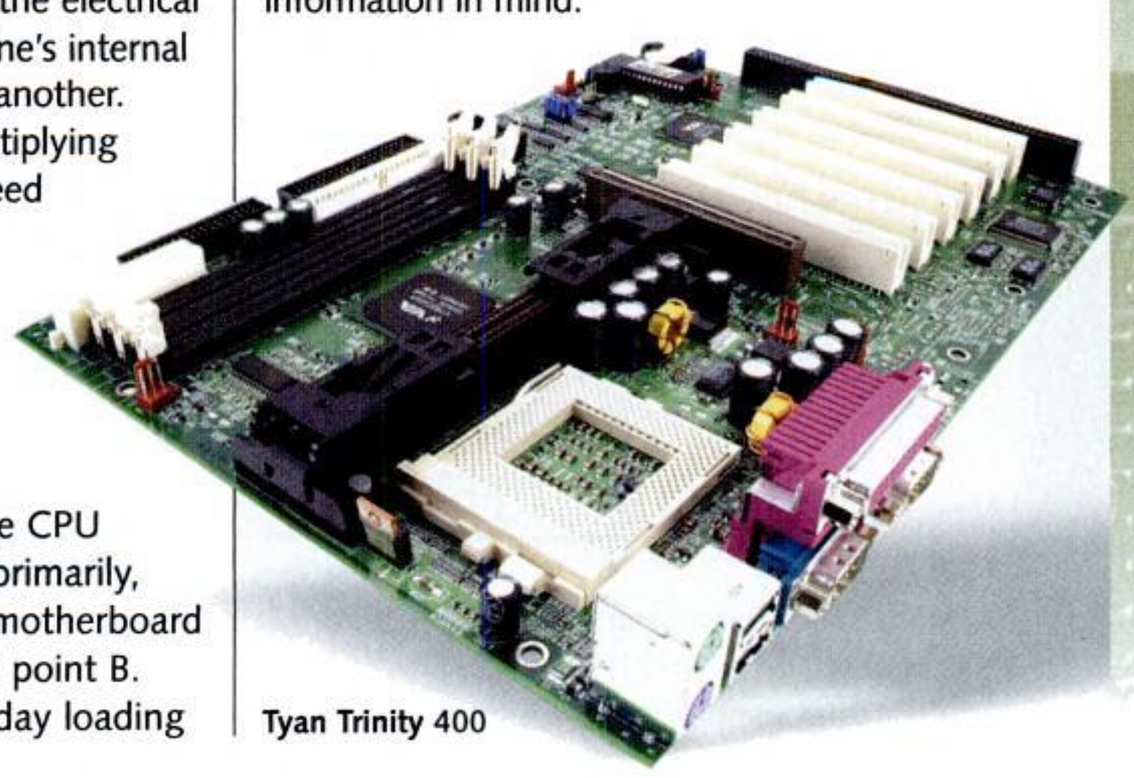
The northie handles tasks that the CPU doesn't have time to take care of—primarily, moving information around on the motherboard and ensuring it gets from point A to point B. The northbridge spends most of its day loading data from the hard drive into system memory, and from system memory into the CPU. It also deals directly with your AGP videocard via the dedicated AGP bus, managing fancy-schmancy tricks such as system memory texturing, side-banding, and fast writes. Lest you think that the AGP bus gets preferential treatment, note that PCI slots are also allotted direct access to the northbridge, albeit at a slightly slower speed than the AGP bus.

Only the ISA bus, the redheaded stepchild of peripheral motherboard buses, isn't managed by the northbridge—that thankless task falls to the southbridge chip. The southbridge also controls data flow to and from ports on the back of the computer (USB, PS/2), and manages data through the components connected to the machine's IDE controllers. While it seems as though the northbridge enjoys the lion's share of the chipset's responsibility, it's in the southbridge that chipset manufacturers have space to innovate and add functions such as onboard Ethernet and IEEE-1394 connectivity.

Usually, a chipset's northbridge and southbridge chips spring forth from the same manufacturer. But with the dawning of the Athlon, and the AMD 750 chipset that supports it, motherboards entered a new era of hybridization: The ASUS K7M and FIC SD11 mobos both feature an AMD 751 northbridge working with a VIA 686A southbridge.

CHIP BY CHIP

The data careening around your motherboard buses may be moving at different speeds, but those rates are hardly random—the speed of your system bus affects the speed of other buses on the motherboard. So, for example, overclocking the frontside bus to bump up the speed of the CPU also jacks up the speed of your memory. As you peruse the following bounty of chipset options, keep this information in mind.



Tyan Trinity 400

INTEL PIII

AMD K7

VIA

SIS

ALI

Your personal tech briefing on the concepts and components that comprise the PC experience.

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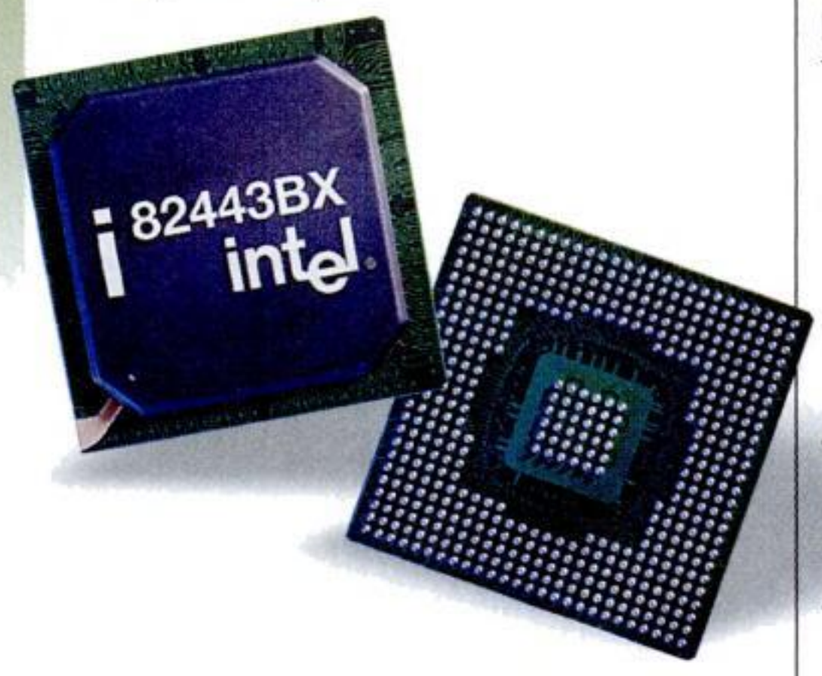
Intel 440BX

Officially supported bus speeds: 66MHz, 100MHz
Total memory support: 1GB SDRAM
Max. CPUs supported: 2
IDE support: ATA/33
AGP speeds: 1x, 2x



The Intel BX chipset is getting a bit long in the tooth, but it remains the chipset of choice for enthusiasts. As the longstanding de-facto chipset for Pentium II/III and Celeron CPUs, the 440BX is exceedingly flexible, and a true tweaker's delight. New BX motherboards have been retrofitted to support the faster bus speeds and lower voltage requirements of Intel's 1GHz Coppermines, extending the life of this venerable chipset. Though it doesn't support ATA/66 or AGP 4x, and won't "officially" sustain the new 133MHz frontside bus found on some Coppermine CPUs from Intel, the BX chipset still makes a good showing.

Intel 440ZX

Officially supported bus speeds: 66MHz (440ZX-66), 100MHz (440ZX-100)
Total Memory support: 256MB SDRAM
Max. CPUs supported: 1
IDE support: ATA/33
AGP speeds: 1x, 2x

Introduced by Intel as the low-cost alternative to the mighty BX chipset, the ZX chipset was mainly intended for use with the Celeron, but never really caught on. Although it offers a cheaper chipset option, motherboard vendors who use the ZX when building low-cost, entry-level boards frequently limit those boards' upgrade paths by integrating video and offering fewer DIMM slots.

Intel 810e

Officially supported bus speeds: 66MHz, 100MHz, 133MHz
Total memory support: 512MB
Max. CPUs supported: 1
IDE support: ATA/66
AGP Speeds: 2x

Following the tragedy that was the 810 chipset and the calamity that was the 820 chipset, Intel scrambled for a chipset that could support Coppermine CPUs. Its initial answer? The catastrophe that is the 810e chipset. The 810e integrates Intel's i752 graphics capabilities directly into the northbridge; as a result, 810e motherboards have no need for AGP expansion slots. Thus, the 810e was hardly the best option for a brand spankin' new P-II or III. Though not a bad option for an entry-level Celeron system, the 810e has no place in a high-end machine.

However, the 800-series (810, 820, and 840) did herald a new era of chipset functionality. Rather than connecting the north and southbridges by the PCI bus alone, Intel created north and south "hubs" linked with a dedicated high-speed bus, resulting in faster data transfers between the two.

Intel 820

Officially supported **bus speeds:** 66MHz, 100MHz, 133MHz
Total **memory support:** 1GB RDRAM (or SDRAM with MTH)
Max. CPUs supported: 2
IDE support: ATA/66
AGP speeds: 1x, 2x, 4x

The eleventh-hour discovery of a flaw within the 820 chipset delayed its initial release. When it finally did appear, the 820's support for RDRAM—and the extra costs associated with it—resulted in lackluster sales.

Intel responded by introducing the memory translator hub (MTH), which is designed to convert RDRAM signals to SDRAM and allow the use of standard—and inexpensive—SDRAM on 820 boards. But the MTH introduced additional overhead and bugs to the 820 equation, in the form of performance problems and incompatibilities with SDRAM. At press time, Intel was recalling all 820 motherboards with SDRAM support, and offering 820 RDRAM boards in exchange.

VIA Apollo Pro 133

Officially supported bus speeds: 66MHz, 100MHz, 133MHz
Total memory support: 1.5GB SDRAM
Max. CPUs supported: 1
IDE support: ATA/66
AGP speeds: 1x, 2x

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As VIA's first chipset to support Intel's Coppermine CPUs, the Apollo Pro 133 extended some noteworthy attributes, such as support for a 133MHz frontside bus and ATA/66. Unfortunately, the chipset's lackluster memory performance leads to poor overall system performance, making the Intel BX a far better choice. Though the Apollo Pro 133 was among the first chipsets to support a 133MHz frontside bus speed, the memory problems have kept it from mass adoption.

VIA Apollo Pro 133A

Officially supported bus speeds: 66MHz, 100MHz, 133MHz
Total memory support: 1GB SDRAM
Max. CPUs supported: 2
IDE support: ATA/66
AGP speeds: 1x, 2x, 4x

Intel's troubles with the 820 chipset have meant happier times for the folks at VIA, who've stolen some of Intel's market share with a revamped version of the 133 chipset. VIA addressed the memory performance problem and added support for AGP 4x, putting the 133A's performance on par with Intel's 440BX chipset, and making the Apollo Pro 133A one of the most attractive chipsets currently on the market.

VIA Apollo KX133

Officially supported bus Speeds: 200MHz
Total memory support: 2GB SDRAM
Max. CPUs supported: 1
IDE support: ATA/66
AGP Speeds: 1x, 2x, 4x

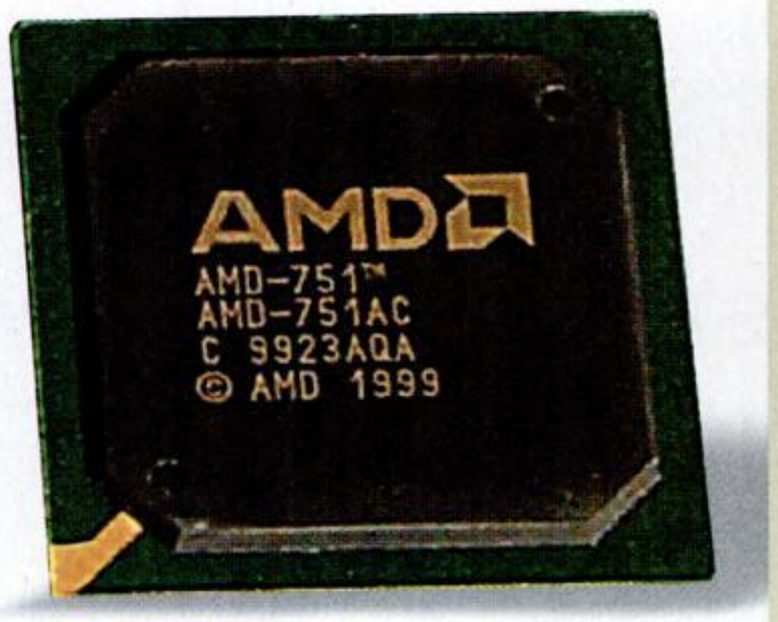
The long-awaited KX133 is the first VIA chipset to support AMD's Athlon. With support for a 133MHz memory bus, the KX133 offers a big performance increase over AMD's own 750 chipset, which locks the memory bus at 100MHz. The KX133's AGP 4x support won't yield much of a performance difference right now, but it will mean big gains in future games.

The only roadblock to the KX133's future success is its complete incompatibility with AMD's upcoming Thunderbird processors. For that, you'll need VIA's upcoming KZ133 chipset.

AMD AMD-750

Officially supported bus speeds: 200MHz
Total memory support: 768MB SDRAM
Max. CPUs supported: 1
IDE support: ATA/66
AGP speeds: 1x, 2x

The chipset AMD created to support its own Athlon CPUs was impressive when it initially launched, but its success was short-lived. Without support for AGP 4x and PC133 SDRAM, and memory topping out at 768MB, it's doubtful that this chipset will remain competitive in the current marketplace. The AMD 750 is far from washed up, however. The chipset still remains useful due to its compatibility with AMD's upcoming Thunderbird Athlon.



Chips on the Rise

Intel 815: Very little is known about this chipset, but it's rumored to combine the best features of the BX with those of the 820. Support for Coppermine, PC133 memory, AGP 4x, and the newly announced ATA/100 specification are all expected.

Intel 820e: It's been predicted that with the 820e, Intel will address the original 820's problems with support for more than two RIMMs, and added support for ATA/100.

AMD 760: With the 760, AMD should regain its title as performance leader in Athlon chipsets. The major changes here will be support for AGP 4x and for DDR-SDRAM, which can transfer data on the rising and falling edges of the clock, resulting in twice the bandwidth of PC133 memory.

AMD 760MP: As if 760's DDR-SDRAM support wasn't cool enough... AMD's 770 chipset should offer the same features that the 760 has, with one major addition: dual-processor support. It's two, two, two procs at once—and there just can't be anything bad about that.

VIA KZ133: VIA's KZ133 should address the problems that make its KX133 chipset incompatible with AMD's Thunderbird Athlon. Slated for release this summer, the KZ133 will ship solely in Socket A flavor, and will sustain AGP 4x, PC133 SDRAM, and improved support for ATA/66.

VIA Apollo Pro 2000: VIA is expected to first bring PC2100 DDR memory support with its Apollo Pro 2000 later this year. With AGP 4x and, most likely, ATA/100 in the southbridge, the Apollo Pro 2000 will give Intel's 820e a run for its money.

VIA K7-DDR: With its K7-DDR chipset closely following the Apollo Pro 2000, VIA is out to show that it's as big a supporter of AMD silicon as it is of Intel's. VIA will serve up seconds with its new Athlon chipset, but they won't be sloppy. The feature set is expected to be on par with the Apollo Pro 2000 with AGP 4x, ATA/100, and PC2100 DDR support.

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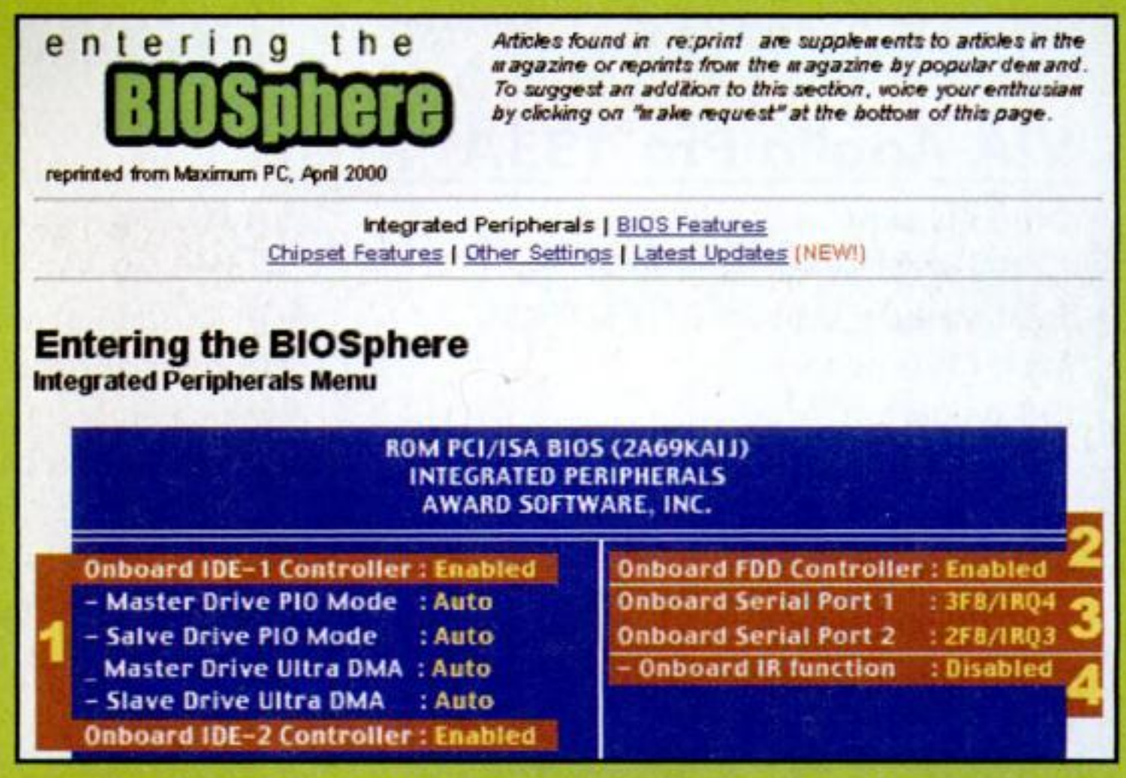

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Divining DSL

My DSL provider is offering three different types of DSL modems: an external using a network card interface, an external with a USB interface, and an internal PCI. Which one will provide the fastest download and lowest latency?

—Wendell J. Louis

First, Wendell, you should know that since average DSL downstream rates are only 1Mbps, this limitation will be the bottleneck regardless of the interface you choose. If one is going by theoretical throughput levels alone, a PCI modem is your best bet. In general, a PCI card (with a rate of 133Mbps) is fastest, with Fast Ethernet (commonly called 100 Megabit Ethernet) a distant second (12.5Mbps), and USB (1.5Mbps) and standard 10Mb Ethernet (1.25Mbps) bringing up the rear.

However, this is purely theoretical and does not take into account the myriad other factors that can ultimately affect speed. The first, which you mentioned, is latency (the delay between a request and the response). While the speed of your connection does affect latency, your ISP's connection to the Internet backbone, the distance to the server to which you're connecting, current load on that server, and whether someone in the next town got overanxious with a backhoe that day are bigger factors than the connections within your PC.

Another thing you may not have considered is related to which operating system you're using. With most USB or PCI DSL modems, driver support is limited to Windows. If you have dreams of running Linux or BeOS with a net connection, the modem with the network card interface is the only way to go. BeOS and Linux driver support may be lacking for DSL modems, but many network cards are supported by both OSes.

If you're considering one of the new routers specifically designed to connect multiple computers to a DSL or cable modem via an Ethernet connection, the decision is all but made for you. Ethernet is the only way to go.

If you have dreams of running Linux or BeOs with a net connection, the modem with a network card interface is the only way to go.

Beige Begone!

Inspired by one of your 1998 articles, I recently built my own machine out of parts purchased from various places on the Internet. Your magazine often refers to benchmarking. How is this done, and how can I benchmark my own machine?

On a slightly different subject, is it possible to dispense with the computer case altogether? I need more working room and thought I would build my next machine into an old desk. I want to use the top drawer for my DVD-ROM, middle drawers for hard drives, and the bottom drawer might be the diskette drive (buried beneath the socks and underwear). I would mount the motherboard on the back panel behind the drawers and put the keyboard in the front utility drawer. Is there any technical reason, other than aesthetics, why this couldn't be done? Dust? Cooling?

—Norm and Diane

The two main concerns we have with wacky cases are drive mounts and heat.

The apps that we use to benchmark are available on the Maximum CD, and our testing methodology is fully documented at **www.maximumpc.com/benchmarking**.

Ditching the mid-tower isn't for everyone, and could be quite dangerous if done incorrectly. The two main concerns we have with wacky cases are drive mounts and heat. If you don't get your DVD and hard drives completely immobilized, jitters can damage the drives' sensitive innards, resulting in data loss and an unstable system. On the other hand, a floppy drive is capable of taking a beating, so if you want to abuse your floppy, you have our permission.

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Heat management is another killer. Modern processors get hotter than a bowl of 12-alarm chili, so you must consider how you're going to move that much heat out of your desk. Since most desks don't come with massive cooling holes, you'll need to make some yourself. We recommend planning for bottom-to-top airflow—just be sure that notorious heat generators, such as videocards and your CPU, have good airflow.

Before you start drilling holes in your desk, think about the following: If you mount a motherboard behind the drawers in your desk, will the drawers still close? Are your carpentry skills up to shortening drawers? Can you get the appropriate cables to the appropriate places and still have functioning drawers? Good luck, and send us a pic when you're done!

IR-Curious

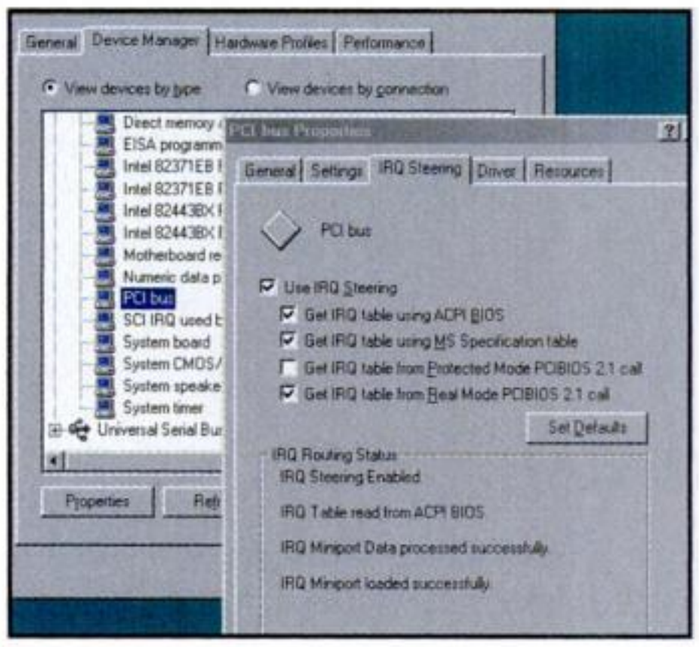
I recently installed a new soundcard, the Diamond MX300. The install went well, but I'm not getting sound in some games. Looking through my device manager, I saw that one component, the Monster Sound II PCI device, had a conflict with something called an "IRQ holder for PCI steering." I can't get rid of the IRQ holder, and Windows won't let me change settings for my IRQs. I even used my BIOS (thanks to that Biosphere article) to force the soundcard to use another IRQ, and Windows reallocated the holder along with it! How can I fix this steering crap?

—Bill Grasso

Disabling IRQ steering should be done only as a last resort, as it can wreak havoc on a system with non-PnP devices. The IRQ holder for PCI steering is supposed to be there. IRQ steering is a feature that's been around since Windows 95 OSR2. What does it do? Steering is supposed to allow dynamic reconfiguration of Plug-and-Play devices when conflicting non-PnP devices are introduced into the system. Sounds great, right? But, we've occasionally seen it cause problems.

For example, suppose your MX300, a PCI soundcard, is assigned IRQ 10 by the BIOS when you start your computer. Unfortunately, if you add a new non-PnP device to your system, such as an old ISA modem configured to use the same IRQ, and your BIOS doesn't detect it, you may have a conflict. IRQ steering solves this problem by disabling the MX300, removing it from IRQ 10 and reassigning it to a free IRQ controlled by an IRQ holder, where the MX300 is re-enabled.

If you really want to disable PCI steering, go to the Device Manager, then double-click on the System Devices branch and open the PCI bus device. In the IRQ Steering tab, uncheck Use IRQ Steering.



IRQ steering allows dynamic reconfiguration of Plug-and-Play devices when conflicting non-PnP devices are installed. Disabling it may clear up any problems, or it could cause more.

Trojan Trouble

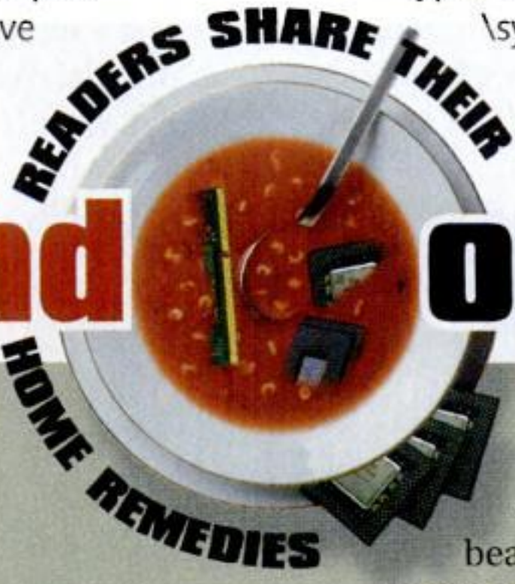
I was getting alerts from *Norton AntiVirus* indicating that a trojan backdoor has been found. I was able to contain it, but when I scanned for viruses, it came up with an infected file called kerne132.dll. I had the option of deleting it or containing it. I decided to delete it. Now I'm getting this error prompt: "Cannot find the file 'kerne132.dll' (or one of the components). Make sure the path and file name are correct and that all required libraries are available." How can I fix this?

—Brian Tabios

"Since kernel 32.dll is a vital part of your system, you'll have to restore it from your original Windows 98 CD."

Since kernel32.dll is a vital part of your system, you'll have to restore it from your original Windows 98 CD. Once you've inserted the CD, open a DOS window by going to Start, Programs, MS-DOS Prompt. In the DOS window, type "extract /y /a <your CD-ROM drive letter here>:/base4.cab kernel32.dll c:\windows\ system" (without the quotes).

If you get an access denied message, you can save the file to c:\ instead of c:\windows \system, then replace it in DOS. To do that, restart the computer in DOS mode (press F8 at the Starting Windows 98 screen). Then type "copy c:\kernel32.dll c:\windows \system\kernel32.dll," and vóila, no more kernel32.dll errors.



second opinions

Digital Debate

I want to protest the advice you gave Steven Urban in your April issue, concerning digital speakers. I am the owner of a Sound Blaster Platinum, essentially the same soundcard Mr. Urban has, and it is coupled with a set of Cambridge Soundworks digital speakers. These speakers have dual inputs and I have tried both; the digital input is by far the superior of the two. Not only is the input free of distortion, as you pointed out, but the dynamics of the audio also far exceed that of the analog channels. I would recommend that he plug in the digital output from his CD-ROM to the input on his soundcard, for maximum signal transfer. I paid only $99 for these speakers and they destroy my pricey Altecs. I would recommend that Mr. Urban visit his local computer reseller and have a listen to these beauties. I don't think he will be disappointed.

—Michael Carr

Michael—We're glad to hear you got better sound by switching to your speakers' digital inputs. Our point to Mr. Urban was that, although digital doodads may provide an incremental improvement, you'll never go wrong by buying quality speakers. Mr. Urban was considering Klipsch ProMedia v.2-400s, which we rated "10/Kick Ass" in our January 2000 issue, calling them "far and away the best system we've ever heard." The Cambridge FPS2000 digital speakers' weak performance, on the other hand, merited only a 5 in our September 1999 review. We noted then, "About the only thing the digital port did was lower the amount of hiss flying out of the satellites at higher volumes; sound quality didn't dramatically improve."

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REVIEWS

THE END IS NEAR

This month, signs of the Apocalypse are everywhere. First, *Daikatana* went gold (shipped off for mass duplication) and a single-player demo was released, showing the world that John Romero has indeed been working on *something* for the past four years. But when we called Eidos for a copy, we were told no gold copies were being sent to reviewers because the company needed time to add copy protection to CDs. Shyeah, right. Eidos finally relented, and we scored a copy. Then came the announcement that our sister magazine *PC Accelerator* was folding. Say what you will about the mag's babe-o-rama and toilet humor, but the *PCXL* crew offered the most biting humor and sarcasm in all of gaming. They will be missed. The third sign that the four horsemen are upon us is that this month, an Alienware PC did not receive a Kick Ass award. What's next, the arrival of the BitBoys Glaze3D 2400? Either way, we've got Gordon hard at work, building a bunker beneath the test Lab.

— JOSH NOREM, REVIEWS EDITOR

BEHIND THE BENCHMARKS

This month: Notebooks

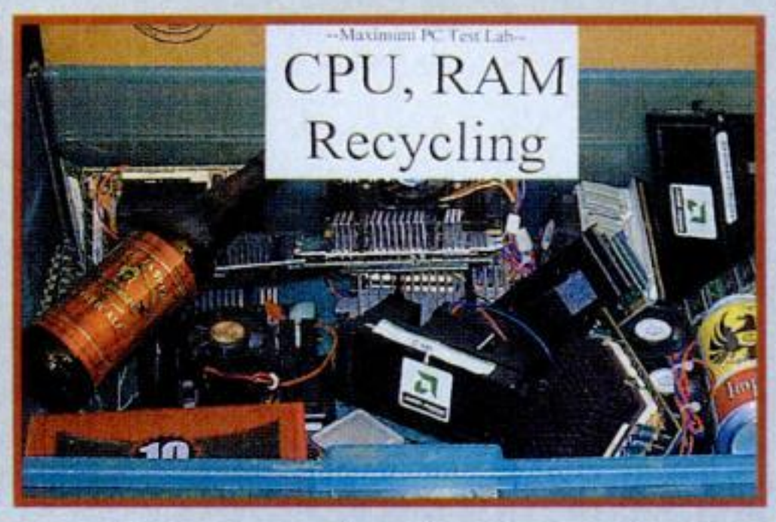
We run notebook benchmarks with the understanding that notebooks aren't as powerful as their desktop cousins, and that their scores should be, on average, 30 to 40 percent lower. That's why we haven't upgraded to *Unreal Tournament* as a test for Direct 3D on a notebook; it just wouldn't be fair. We'll keep using *Expendable* until technology catches up. In addition to what the scores tell us, we split our real-world testing into three areas—size (Is the machine small? Is it really a portable solution?), ergonomics (Is the screen too small? Is the track pad responsive?), and functionality (battery life, heat output, and proc speed all factor in here). Want to be sure you're buying a solid notebook without bringing a bunch of benchmark disks to CompUSA? Ask the salesman whether the notebook is powerful enough for Windows 2000. The new O/S is extremely stable, but only on powerful notebooks, so if you can run 2000, your machine is good enough for government work.

Everyday is Earth Day at Maximum PC

At *Maximum PC*, the only thing we love more than over-the-top PC power is helping to maintain Earth's fragile ecosystems. Of course, we'd be lying if we didn't admit to lighting various PC components on fire from time to time, releasing noxious gases in the direction of the *MacAddict* staff, but overall, we strive for an eco-friendly workplace.

In honor of Mother Earth, we recycle religiously. Everything that isn't consumable or hazardous goes into one of the several recycle bins we have set up in the Lab.

While benchmarking hardware, we occasionally enjoy a tasty libation. After our thirst is quenched, we dispose of the bottles in this nifty purple bin.



Yesterday's silicon ends up here. We've offered a few leftover 1GHz CPUs to the *PC Gamer* boys, but since their mobos don't have the requisite multipliers, they couldn't use them.

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A behind-the-scenes look at the Maximum PC Lab and the gearheads who work in it.

21 PRODUCTS REVIEWED!

RIGHTEOUS WEB SITE: GAMECOPYWORLD.COM

This site states clearly on its front page that it supplies solely the information and tools necessary to make a *personal backup* of legally owned game CDs. Right. Whether you want to make backups or not, this site has a tremendous amount of information about the world of CD-R drives, software you can use to beat copyright protection, and cracks that let you play games without the CD. For newbies to the "game backup" world, this site is your Graceland.

GameCopyWorld

PREHISTORIC VIDEOCARD DISCOVERED

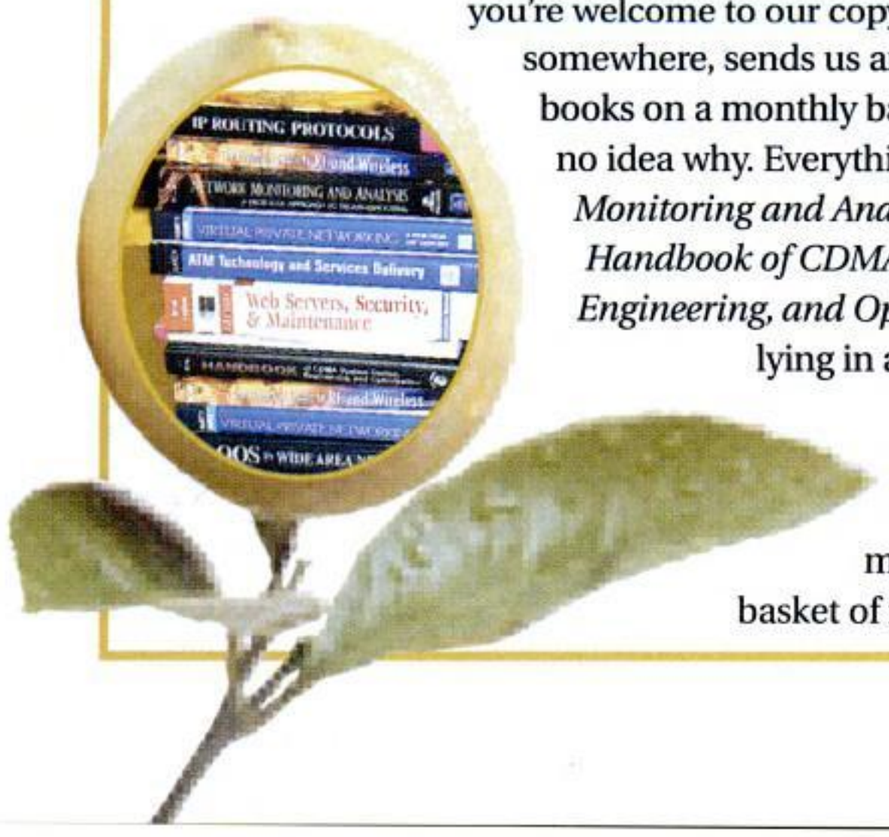
While clearing out the Lab refrigerator, we came across this videocard trapped in an icy cocoon. At first glance, we thought it was a moldy Choco Taco, but further inspection revealed that it was, indeed, a Creative Labs Riva Blaster TNT1! "This card is so old, it doesn't even have T&L!" exclaimed Gordon. "Yeah, but neither do 3dfx cards," replied Sean. Of course, we

were instantly curious as to whether the card was still functional after being trapped in ice for two years. We hesitantly shoved the card into the AGP slot of an old Dell test system. "Get back!" yelled Geoff as the machine began to boot—he feared "a short circuit or something." Amazingly, the card functioned without incident, proving it's OK to freeze hardware.

Lemon of the Month

Information Technology books

If you're interested in *QOS in Wide Area Networks*, you're welcome to our copy. Somebody, somewhere, sends us arcane IT reference books on a monthly basis—we have no idea why. Everything from *Network Monitoring and Analysis* to the *Handbook of CDMA, System Design, Engineering, and Optimization* is lying in a pile on our floor. Whoever sends these to us: Please stop. We would much prefer a basket of fine cheeses.



CHECK IT OUT online

www.maximumpc.com

Benchmarking: Full Disclosure

Visit **www.maximumpc.com/benchmarking** for the complete lowdown on *Maximum PC*'s benchmarking strategies.

Hardware

- Alienware Area 51 . . . . **78**
- Plextor Plexwriter 12/4/32 CD-RW **80**
- Smart and Friendly CD Rocket Mach 12 . . . **80**
- VideoLogic Scirocco Crossfire **83**
- Boston Acoustics BA4800 speakers **83**
- Sony DCM-M1 Mini Disc AV Recorder **86**
- Pyro IEEE 1394 Firewire adapter **88**
- Guillemot Maxi Sound Fortissimo **89**
- Gallant Odyssey Sound4 . . . . . **89**

Games

- Daikatana (not a typo) . **81**
- Need for Speed: Porsche Unleashed **82**
- Beetle Buggin' **82**
- Championship Bass **84**
- Ultimate Hunt Challenge **84**
- NASCAR 2000 . . . . . **84**

Software

- Dantz Retrospect Express Backup **85**
- McAfee Internet Guard Dog **87**
- Best Defense **87**
- KPT 6 . . . . . **90**
- Emotion 3D Web Edition **90**
- Kazoo 2.0 Viewer **90**
- PowerWare, 22 products reviewed **50**

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Hardware Photography by **AARON LAUER**

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Alienware Area 51

BACK IN BLACK

The Area 51 is loaded with every top-drawer component available, and it's got the benchmarks to prove it.

When the editors of *Maximum PC* awake each morning, we go through a series of daily affirmations. One of these is the mantra, "If a new power part exists, we'll be the first to see it." We're on every vendor's hotlist for new products—or so we thought. Then we received the Area 51 from Alienware (**www.alienware.com**). This system introduced us to no fewer than four new products (all of which we wished vendors would have sent us), including nVidia's GeForce 2 card, Pioneer's 16x DVD-ROM, HP's 9300i CD-RW, and a KX133-based motherboard. Rounding out the package is a 40GB Maxtor hard drive, a Hollywood Plus DVD decoder card, Klipsch Speakers, and a black case that looks the business.

The first thing that struck our eyes when we popped the case wasn't the GeForce 2 but a Promise ATA/66 controller. The KX133 chipset supports ATA/66, so what's the deal? Alienware says the chipset's IDE controller is buggy, and the Promise controller is more a necessity than a performance accessory. Testing backed up this claim—hard drive read speeds registered 11MB/sec attached to the onboard controller, and 24MB/sec when attached to the Promise card.

To test Alienware's claim that the drive's scores were "a VIA issue," we hooked the drive up to both an AMD 750 system and an i820 test system. The drive's scores were the same in each—24MB/sec read speed. Ironically, the Alienware's optical drives were also connected to the Promise controller, and their performance was atrocious. Only by moving them onto the onboard IDE controller did we get the optical drives to realize their full potential.

In its defense, the Area 51's benchmark scores pounded previously tested 1GHz Athlon systems into the ground. To wit, in *SYSmark*, the Area 51 outpaced Compaq's 1GHz by nine points, and Gateway's 1GHz by a stunning fourteen points!

One reason the Area 51 ate the other 1GHz Athlons for lunch is its use of VIA's new-fangled KX133 chipset. The KX133 brings PC133 and AGP 4x to the Athlon-using masses, care of Asus' K7V motherboard. Performance was exceptional, but as stated above, the onboard IDE controller has issues.

As expected, the Alienware's gaming performance was second to none, though its GeForce 2 card could be considered an unfair advantage. For the past few months, systems with DDR GeForce cards have registered the same "50-ish" scores in our *Quake III Arena* benchmark, so we were pleased to see the GeForce 2 raise the bar to 73fps. However, since the board uses nVidia's 5.13 drivers, compressed textures are enabled in *Quake III*. When we disabled this feature, the benchmark score dropped to 61fps.

We experienced looping blue screens of death when tinkering with the system after testing was finished—not good—so we're withholding the Kick Ass award for now. We applaud Alienware's inclusion of so many kick-ass components, but sometimes, older parts that work are better than next-gen parts with problems.

—Josh Norem

PLUSES
Too many to list

MINUSES
- Needs aperture grille monitor
- Onboard IDE controller is buggy
- When down, front sliding panel blocks air flow

UNDER THE HOOD

THE BRAINS

CPU	AMD Athlon 1GHz
L2 Cache	512K, 333MHz, closely coupled
RAM	256MB PC133 SDRAM (1.5GB max)
Motherboard	Asus K7V, VIA KX133 chipset
Drive Bays	Three 5.25-inch, three 3.5-inch (two free)
I/O Ports	One parallel I Two serial I Two USB I Two PS/2 I TV-out I VGA-in I VGA-out S/PDIF-in I S/PDIF-out I MIDI-in MIDI-out I Two line-in I Two line-out Headphone-out

DISPLAY

Video	nVidia GeForce 2 GTS 32MB DDR SDRAM
Monitor	Viewsonic E790 (Black) 19-inch (18-inch viewable), .22 to .26mm dot pitch
Refresh@ Max Res	76Hz @ 1600 x 1200
MPEG Decoder	Sigma Designs Hollywood Plus

STORAGE

Hard Drive	Maxtor DiamondMax 40GB ATA/66 7200rpm
DVD	Pioneer DVD-115 16x
CD-RW	Hewlett-Packard 9300i
Removable	Floppy

NETWORKING

Modem	US Robotics 56K VoicePCI

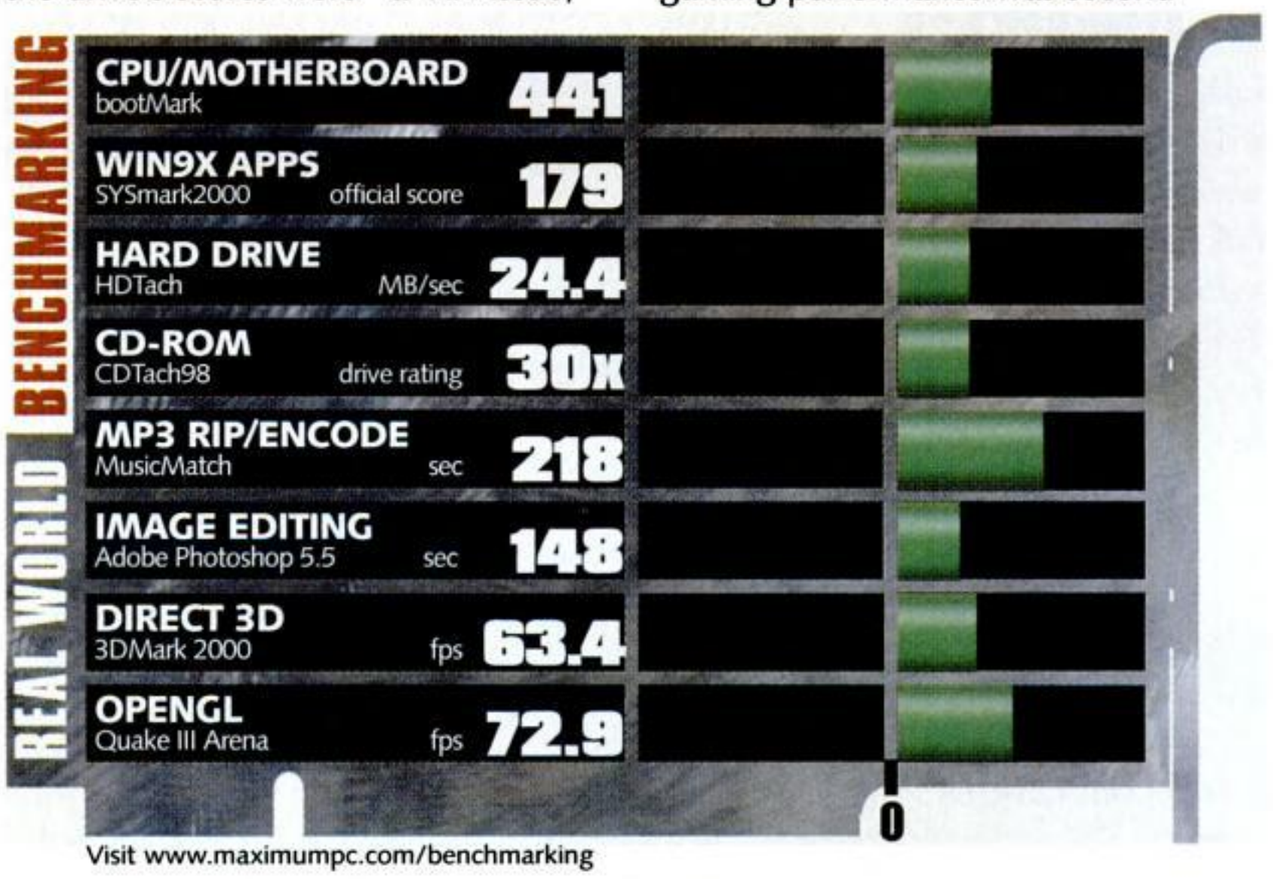
SOUND

Soundcard	Creative Labs Sound Blaster Live! Platinum
Speakers	Klipsch ProMedia V2.400

THE BUNDLE

Gamespy 3D I Free demos of *Half-Life: Opposing Force* and *Expendable* I *Quake III Arena*

BOOT 1:08 DOWN 0:04



Visit www.maximumpc.com/benchmarking

MAXIMUM PC VERDICT 8

$4000 with monitor; $3600 without I Alienware
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EXPANSION NOTES

Like the perfect 10 Dell we reviewed in March, there's just one free PCI slot available, due to this rig's "kitchen sink" approach to component inclusion. It's a shame the Promise controller stole one PCI slot.

EXPANSION MAP

AGP: GeForce 2
PCI: Free
PCI: SB Live! Platinum
PCI: Hollywood Plus
PCI: USR 56K Modem
PCI: Promise ATA/66 controller

IROS

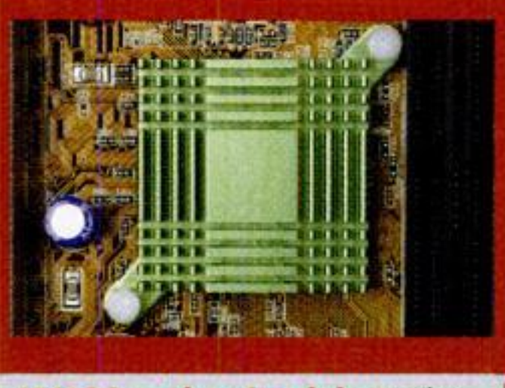
00 System Timer	**10** SB Live!
01 Keyboard	**10** Hollywood +
02 Interrupt Controller	**10** ACPI IRQ Holder
03 COM 2	**11** GeForce 2
04 COM 1	**12** PS/2 Mouse
05 SB16 Emulation	**13** Num. Data proc
06 Floppy	**14** PCI Bus Master IDE
07 LPT1 Printer Port	**15** VIA Bus Master PCI
08 CMOS	
09 Promise ATA/66	
09 IACPI IRQ Holder	

DMAS

01 SB16 Emulation	**03** DMA Controller
02 Floppy Disk	**04** SB16 Emulation

Promise this isn't happening. What's a Promise ATA/66 controller doing in a KX133 system? The onboard IDE controller is buggy as hell. It's a problem VIA is reportedly looking into.

Nothing but a G Thang, part deux. The GeForce 2 GTS runs at 200MHz with a theoretical texel fill rate of 1.6 Megatexels. We'll give it a full review next month.



KX133 makes its debut. The Area 51 is the first retail system we've seen with VIA's vaunted KX133 chipset. Performance was exceptional, and the chipset opens up new levels of performance for Athlons.

What's behind door #1, Wink? The Area 51's Antec case includes a sliding bay cover. Pushing a button at the top of the case causes the door to lower, revealing a killer storage and sound subsystem.

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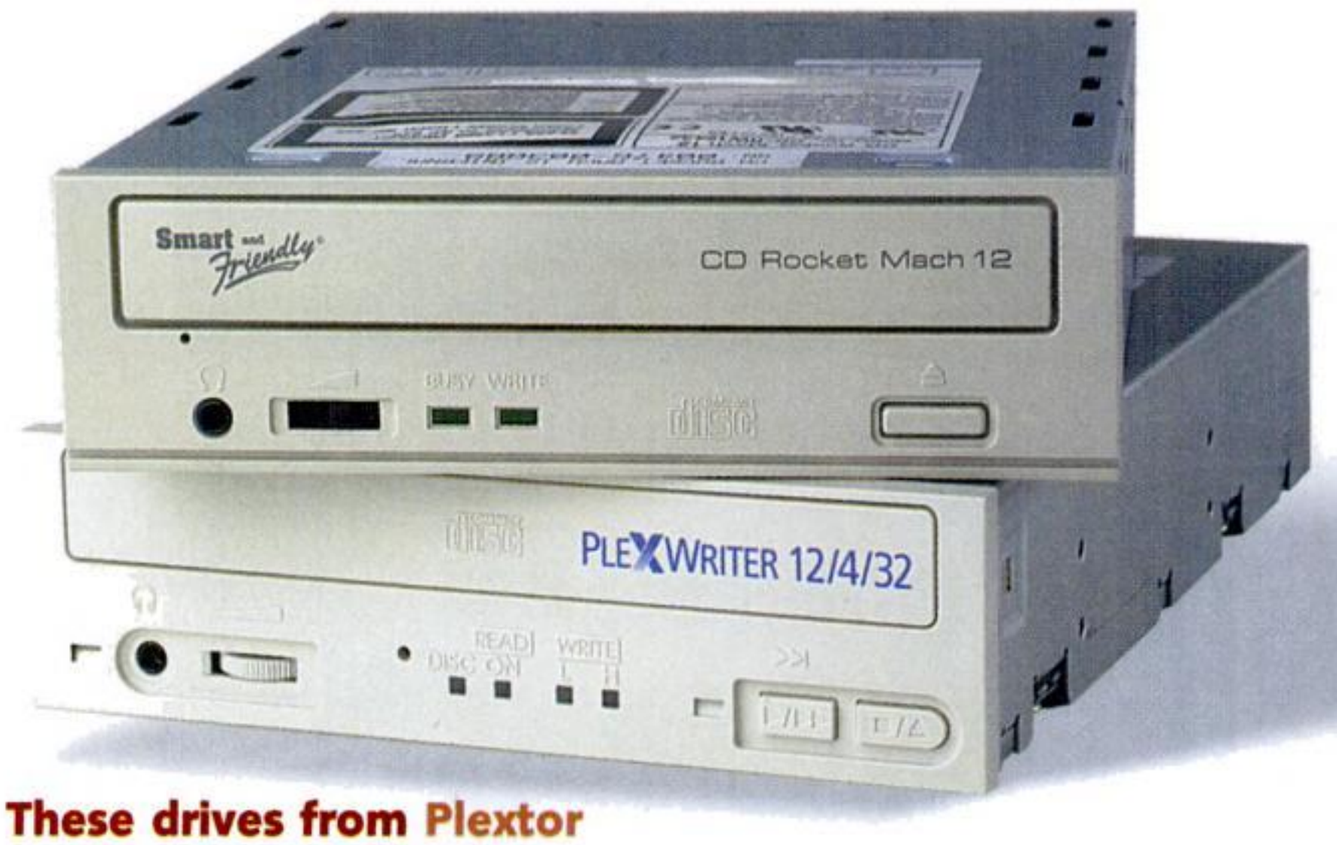
SCSI Burner Scuffle

CD-RW RACE ESCALATES TO 12X

We've said it before, and we'll say it again: SCSI is the ultimate interface for burning CDs. Drives from Plextor (**www.plextor.com**) and Smart and Friendly (**www.smartandfriendly.com**) now burn at a zippy 12x. Here, we've pitted them against one another, *Gladiator*-style, in a fight to the finish.



These drives from Plextor and Smart and Friendly represent the pinnacle of CD duplication.

PLEXTOR

PLUSES
- Compatible with wide range of programs
- Fast

MINUSES
- Bundle should include *Easy CD Creator 4.0*
- SCSI card not included

CD ROCKET

PLUSES
- Fast CD creation
- Killer software bundle

MINUSES
- Not compatible with some programs
- No overburning
- Can't copy games

Plextor's Plexwriter 12/4/32 and **Smart and Friendly's CD Rocket Mach 12** are both very, very fast SCSI drives. They scored virtually neck-and-neck in almost every one of our benchmarks, so how can we recommend one over the other? Easy. Although the Smart and Friendly drive often beat the Plextor by a hair in our benchmarks, the Plextor drive is capable of handling far more tasks, including overburning, bit-for-bit accurate copying, and audio extraction with a wide range of programs. The CD Rocket is a more well-rounded package, thanks to its huge software bundle and included SCSI card, but these amenities are offset by the drive's limited usefulness.

Benchmarks aside, there were certain situations in which the CD Rocket just didn't measure up. The first was game duplication, for which we used Ahead Software's *Nero*. After burning an image to the hard drive, then onto a CD, our game of choice played just fine using the Plexwriter-made dupe. The disc created by the CD Rocket let us install the game, but then continually prompted us to insert the CD. We were also able to overburn a disc with the Plexwriter, something else the CD Rocket couldn't do. Using the Plexwriter, we were able to pack 657MB onto a standard CD-R, and 705MB onto 700MB media.

Audio extraction was another area in which the CD Rocket showed weaknesses. It wouldn't work with *MusicMatch Jukebox*, *Audiograbber*, or *Windac*, and we were unable to run CDTach's Digital Audio Extraction tests on it, since the program works only on Plextor SCSI drives. We eventually decided to use *Easy CD Creator's* built-in ripping capability, and, alas, the CD Rocket came within a tick of the Plextor's scores. The Plextor drive worked with all of the above programs.

Interestingly, while we were testing these drives, Smart and Friendly got locked out of its building due to banking troubles. Then, as we were going to press, S and F's assets were liquidated. Smart and Friendly may be in hot water, but we're told that LaCie (**www.lacie.com**) sells the same SCSI drive in both external and internal models. As far as we're concerned, Plextor's Plexwriter stands victorious in the SCSI drive arena.

—Josh Norem

DARE TO COMPARE

MANUFACTURER	PLEXWRITER 12/4/32	CD ROCKET MACH 12
Drive specification	12x record, 4x rewrite, 32x read	12x record, 4x rewrite, 32x read
Buffer	4MB	4MB
Drive rating	21.4x	**21.6x**
Max. sequential read speed (MB/sec)	**4.73**	4.59
Min. sequential read speed (MB/sec)	2.03	**2.12**
Full stroke/random access times (ms)	**316/138**	**278/127**
CPU utilization (min/max)	1%/7%	1%/9%
Data CD creation (min:sec)	15:33	**12:12**
Mixed mode CD Duplication (min:sec)	**14:20**	14:47
Audio extraction** (min:sec)	**3:07**	3:09
Audio extraction quality	Excellent	Excellent

**Audio extraction tests were performed using Adaptec *Easy CD Creator 4.0* due to the Smart and Friendly drive's incompatibility with all other extraction programs used. All tests were performed using Ricoh 12x compatible media.

PLEXTOR PLEXWRITER — **9**
$400 | Plextor
Buy www.SeeMeBuyMe.com
877.751.7467 ID#0705

CD ROCKET MACH 12 — **6**
$460 | Smart and Friendly
Buy www.SeeMeBuyMe.com
877.751.7467 ID#0706

For definitions of Terminator words, check out the Terminator online at www.maximumpc.com.

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John Romero's Daikatana

FOUR YEARS FOR THIS?

Playing John Romero's *Daikatana* is like taking a trip to hell, alright—only not quite as enjoyable.

After four years of delays, staff walkouts, internal scandal, blown budgets, and incessant media hype, *Daikatana* (**www.daikatana.com**) has finally arrived. Guess what? It sucks! It sucks big-time. In fact, it sucks so bad, we have to wonder what kind of curious monstrosity the developers could have created with an *eight-year* product cycle.

The game was conceived and nurtured by former id Software wunderkind John Romero, and gets its name from a huge sword that sends people through time. Playing as Hiro Miyamoto, you must travel back in time to retrieve the Daikatana, and then use it to transport you and your sidekicks back home.

Traveling with sidekicks is the game's most innovative feature. Unfortunately, these dim-witted sub-ordinates are also the most annoying computer-generated entities we've seen since the Hamspter Dance. They use node-based AI, but this doesn't stop them from refusing to follow you, leaping to their deaths, or getting stuck behind doors (which always close right after you walk through them, stranding the sidekicks in your wake). But wait, it gets worse! Romero has endowed the sidekicks with the gift of gab, and they say things like, "Bad ass! These goons are cruising for a smackdown!" Is that supposed to be funny? It's not. In fact, the canned speech was just one of the many painful, embar-rassments that had us wondering what the hell Romero was thinking.

The graphics are easily the worst we've ever seen from a *Quake II*-based game. Ion Storm says *Daikatana* uses a "heavily modified" *Quake II* engine, but has it been modified to look like *Quake I*? Textures are a blurry mess, and envi-ronments lack even the most basic details. Brown, flaming rectangles pass as torches, and the caverns and corridors look as though a single texture was pasted repeatedly onto every surface. Character models suffer serious polygon deficits, and rather than moving their lips while speaking, they bob their heads up and down like dashboard ornaments. C'mon, Romero—four years and you couldn't even give us moving lips?

Gameplay is almost as bad as everything else. It doesn't matter what episode you're in—your goal is either to find a key, turn some wheel to open a door, or find all the pieces of a broken relic. This type of game-play was acceptable two years ago, but in the post-*Half Life* world, "find key, find exit" just doesn't cut it. Add to this equation the fact that you must spend extensive time gathering up your sidekicks—let alone trying to locate some triangular keystone—and you can see how *Daikatana* could try even a priest's patience. What's more, enemies also have no AI whatsoever, and simply charge directly at you throughout the entire game. Yawn.

Multiplayer options include death-match, capture the flag, deathtag, and even a cooperative mode. We weren't able to test multiplayer, however, since we received only one copy of the game. Regardless, we seriously doubt that anyone will be abandoning *Quake III* or *Unreal Tournament* for *Daikatana* multi-player anytime soon. Among other problems, the game sports awful collision detection and bizarre weapons. Our guess is that only fans of the original *Quake* will appreciate *Daikatana*, thanks to the games' similarities in graphic detail and rapid pace.

—Josh Norem

PLUSES
- Many, many levels
- Many multiplayer game types

MINUSES
- Sidekicks require babysitting
- Graphics are awful
- "Find key" gameplay is boring

Get used to seeing the "loading" screen as **well as the "you can't leave without your sidekick" message, since your sidekick is never around.**

MAXIMUM PC VERDICT 4

$30 | Eidos
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Racing for Yuppies, Hippies

FIRE UP ZEE AUTO, HANZ

PORSCHE

PLUSES
Gorgeous graphics
Tons of game modes and racing action
Porsches galore!

MINUSES
Occasionally sluggish on even high-end machines
Online component not yet ready

BEETLE

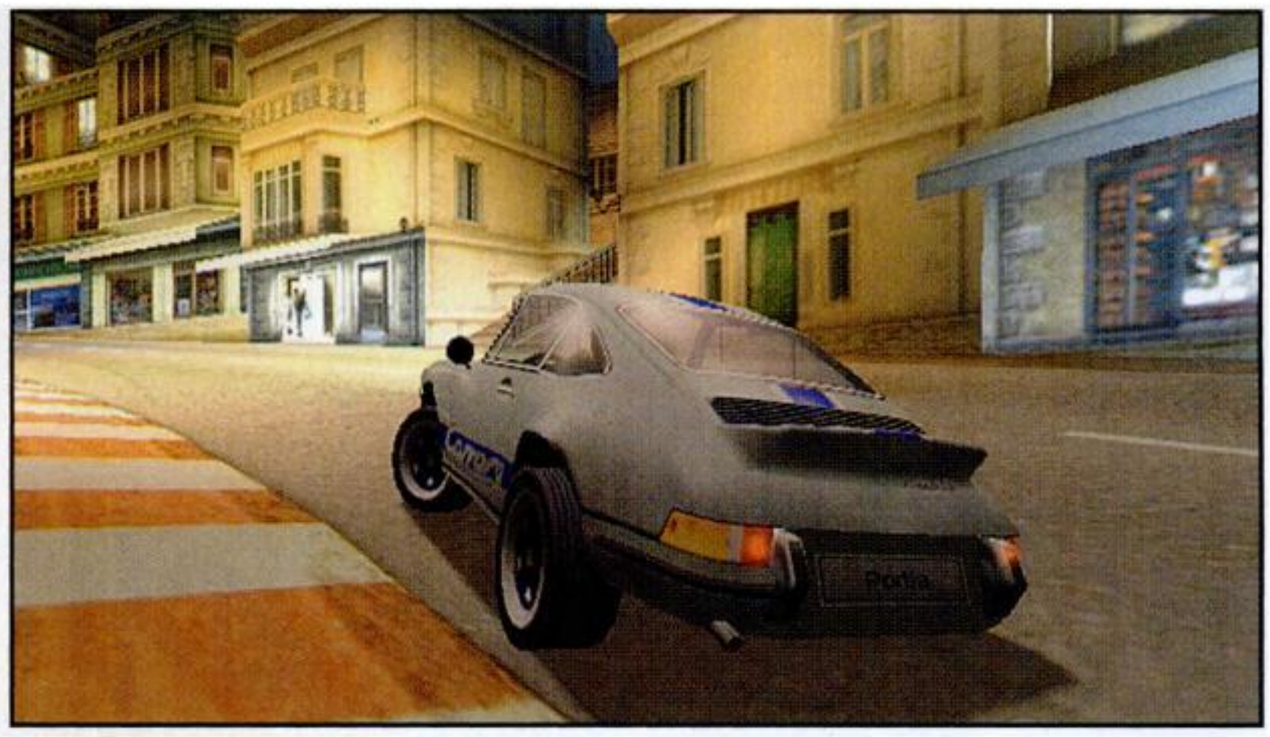
PLUSES
Cruises along on even moderately equipped systems
Forgiving physics model

MINUSES
Appeal may be limited to surf music fans
No TCP/IP support

THE SPECS
PORSCHE
3D CARD SUPPORT
Direct3D
3D SOUND SUPPORT
DirectSound
MULTIPLAYER
Modem | LAN | IPX TCP/IP

THE SPECS
BEETLE
3D CARD SUPPORT
Direct3D
3D SOUND SUPPORT
None
MULTIPLAYER
Split-screen (2 players) | LAN (2 to 6 players over IPX)

Looking to take the wheel of a fine German automobile? Two new games let you do just that. *Need for Speed: Porsche Unleashed* and *Beetle Buggin'* are both good-looking and good fun.



***Porsche Unleashed* has everything to keep arcade-racing fans happy.**

Need For Speed: Porsche Unleashed

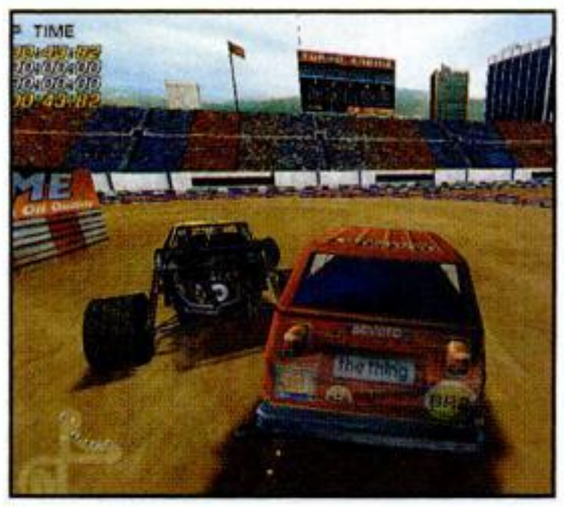
EA's *Need for Speed* games are known for giving gamers the chance to drive exotic sports cars, but *Porsche Unleashed* (**www.eaports.com**) takes the series to a new level. It offers a selection of more than 80 different Porsches, and enough game modes to keep you racing for months on end.

The game's single-player mode lets you take any Porsche of your choice out for a quick race or mini-tournament on one of 14 different racetracks. Five of these courses are closed circuits; the rest are point-to-point races through lush European locations. The Factory Driver mode lets you try your hand as a Porsche test driver, performing a series of increasingly complex driving maneuvers on closed courses or on the open road. Our personal favorite was Evolution mode—a lengthy series of racing tournaments spanning Porsche's 50-year history. If you're good, you can learn first-hand what comes from 50 years of innovation, by taking the wheel of a Boxster or 2000 model 911 Turbo.

Graphically, *Porsche Unleashed* approaches photo-realism, with an outstanding level of detail in the cars, courses, and cockpits. Frame rates were good on our P-III 600/GeForce system, but the pace bogged down when a few cars entered the field of view (upgrading to nVidia's 5.14 drivers helped a lot). The only graphical abnormalities we spotted were nasty pop-ups of scenery in the foreground and in the rear-view mirror—typical driving-game fare.

Unfortunately, *Porsche Unleashed*'s online multiplayer component was still in beta during our review. Apparently, EA is working on online content that will help people find others to race against via the EA web site. Since we didn't participate, we can't speak to this system's potential.

Still, we believe that *Porsche Unleashed* is an absolute gem and a must-have for arcade-racing fans.



Dirt track races are a riot when played against friends.

Beetle Buggin'

Infogrames' *Beetle Buggin'*(**www.infogrames.net**) isn't going to revolutionize the arcade-racing genre, but who can't appreciate the inherent fun in driving a jacked-up VW monster truck around a mud pit with 50s surf music blasting on the radio?

The game offers a variety of modes, including a standard road race, dirt-track challenges, a jump course, and a monster-truck obstacle course. You can compete against friends in a split-screen mode, or throw a two-to-six player party over an IPX network. Our favorite mode by far was the multiplayer dirt track racing—we loved sloshing our Beetles around in the mud, bashing into our friends' cars, and power-sliding around the track.

Unlike a real Volkswagen, the *Beetle Buggin'* VWs never break down, and you can bash and bump your way around a track without fear of flipping over (or even taking any damage).

The graphics are crisp and nicely detailed, but more importantly, they fly along on just about any 3D-accelerated machine. We tested the game on a P-III 600/GeForce setup, as well as a Pentium 233/ Voodoo2 combo, and it ran well on both. The game's soundtrack is comprised solely of surf music, which is funny at first—and totally fitting to the game's theme—but a bit annoying after a while. Still, *Beetle Buggin'* looks good, it's inexpensive, and it's fun.

—Michael E. Ryan

PORSCHE UNLEASHED **9**
$40 | Electronic Arts
Buy www.SeeMeBuyMe.com
877.751.7467 ID#0708

BEETLE BUGGIN' **7**
$20 | Infogrames
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Sonic Showdown

KLIPSCH BEGINS TO FEEL THE HEAT

Not long ago, computer gaming audiophiles were stuck with spartan and downright expensive choices when it came to solid 4.1 speaker setups. Then came the Klipsch Pro Media system. Not only did it score *Maximum PC's* elusive perfect-10 Kick Ass verdict, it also revitalized the entire performance-audio segment of computer speakers. Now, two capable systems step up to challenge Klipsch's reign.

Boston Acoustic BA4800

Boston Acoustics has a great rep, but is mostly known in the PC arena for its bargain speakers bundled with OEM systems—which is unfortunate. Boston Acoustics knows a lot about audio, and the BA4800s are proof (**www.bostonacoustics.com**).

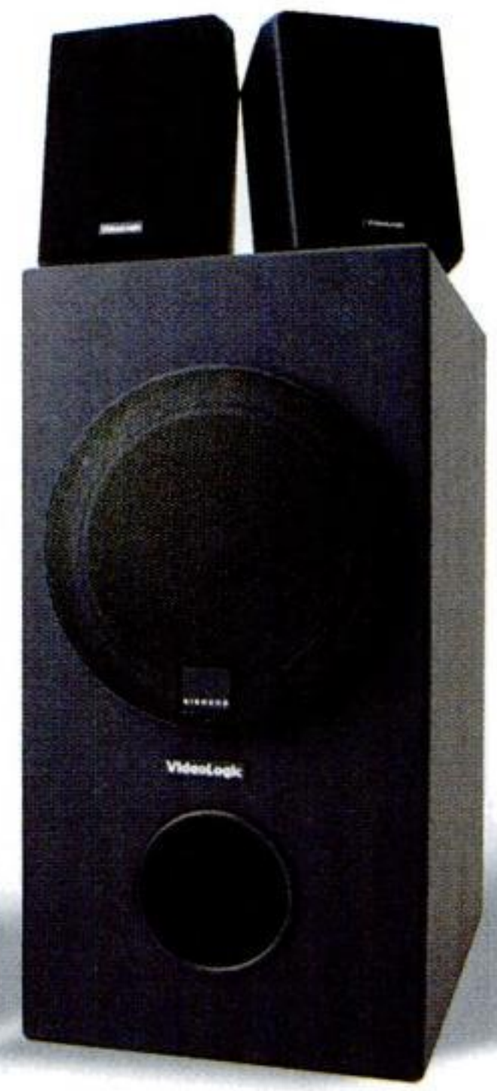
With four discrete satellites packing 2.5-inch drivers, the BA4800s deliver startling clarity with virtually no clipping. At full volume, we couldn't coax them to distort in any game or DVD movie. When we turned to our ultimate ball-buster—a piano solo from a Chopin piece that brings most speakers to their knees—the BA4800s let out a bit of static, but only at volumes that would have Pantera fans covering their ears.

The satellites are amazingly tiny. The three-inch cubes can be easily tucked out of the way for optimal positioning. Another nice touch is the inclusion of a sturdy grill that protects the drivers but, thankfully, doesn't color the speakers' output.

The BA4800s have dual front/rear inputs for dual output soundcards, but there's no digital input or decoder, so you'll have to rely on the source for Dolby or Prologic effects.

The sub is a beefy 6.5-inch design in a sturdy ported enclosure. Sound quality is substantial and tight—which is surprising, since there's no cone. Response was solid down to 50Hz and the volume was enough to instigate complaints from the attorney who works above our Lab.

Dollar for dollar, the BA4800s are an excellent choice for the audiophile on a budget.



But wait... there's more! If you order now, not only will you get the front speakers and the rear speakers and the subwoofer, but we'll also include a massive break-out amp!

VideoLogic Sirocco Crossfire

VideoLogic's 4.1 Sirocco Crossfire speakers (**www.videologic.com**) give the $250 Klipsch Pro Media system a serious run for its money—at almost twice the price.

The four 5-inch satellites are constructed of high-caliber Audax drivers powering 10mm dedicated tweeters and 3-inch mid-range cones that produce incredibly crisp sound. In testing, the sats were perfect for everything from DVD to games to seriously loud music playback. And the Crossfires didn't distort Chopin at even those extreme volumes at which the Klipsch sats began showing signs of submission. This was especially surprising given their lightweight casings. The only downside is the flimsy, gauze-like grills covering the satellites.

Bringing up the low-end is a 40-watt monster of a subwoofer. With a ported 6.5-inch Audax polymer dome driver in a medium-density fiberboard enclosure, this black beauty dives all the way down to 35Hz response with gusto (the grill on the sub is considerably more sturdy).

But the real star of the Crossfire show is the mammoth break-out amplifier. With separate amplification for each channel, crosstalk is all but eliminated, producing a very clear signal. With big dials for main volume, sub volume, fade, and a source selector, the Crossfire has connections for everything (including two additional input sources—a VideoLogic staple). There's even a much-welcomed front headphone jack, something neither the BA4800 nor the Klipsch includes.

From the gold-plated RCA connectors to the 20-foot, stripped-wire, rear-speaker connectors, the Crossfire system is a robust alternative to the Klipsch Pro Media for those with money to burn.

—Brad Dosland

Don't let the tiny sats fool ya... the BA4800 makes big sounds.

BA4800

PLUSES
- 3D sound inputs
- Tiny sats, big sound
- Affordable

MINUSES
- No headphone jack
- Sub lacks a cone driver
- No digital input
- No Dolby or Prologic decoding

SIROCCO

PLUSES
- Capable two-way sats
- Tight at high volumes
- Cone driver on sub
- Mondo break-out box
- Separate amp channels

MINUSES
- Pricey
- Delicate sat grills

BA4800 — 9
$200 | Boston Acoustics
Buy www.SeeMeBuyMe.com
877.751.7467 ID#0710

SIROCCO CROSSFIRE — 9
$450 | VideoLogic
Buy www.SeeMeBuyMe.com
877.751.7467 ID#0711

For definitions of Terminator words, check out the Terminator online at www.maximumpc.com.

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Redneck Roundup

HUNTIN', FISHIN', AND NASCAR RACIN'—YEEHAW!

If you like the manly practice of species domination but don't want the muss and fuss of actually killing living creatures such as fish, deer, and turkeys, you'll be happy to know that EA (**www.easports.com**) offers a couple of games that will appeal to your aggressive tendencies. And for all you back-seat drivers who swear you're more skilled than Dale Earnhardt, *NASCAR 2000* is your chance to prove it.

(Disclaimer: All these games use Direct3D hardware acceleration, and the graphics are ridiculously bad.)

This very tactical game involves creeping up to an animal, then blowing its brains out. Woo-whee!

PLUSES
- Bass game was ridiculous—so much so that it was fun
- Hunting game was good for a laugh
- Rubbing self in buck urine is fun

MINUSES
- Graphics are horrid
- Killing deer creates guilt
- NASCAR is boring

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Championship Bass

We installed *Championship Bass* to make fun of it, but actually found ourselves caught in a fishing frenzy.

The game starts in the "prep pond," where you cast your lure by aiming a crosshair over the pond and clicking your mouse button. If you're lucky enough to drop your lure where the fish are hiding, you'll soon have a "hawg" on the line. Hauling in the bigger fish is mighty tough—we found ourselves more fatigued after hooking a 10 pounder than we would have been after an hour-long frag-fest.

Overall, this was the most fun game of the bunch, thanks to its laid-back playing style and its increasingly challenging nature. We recommend you drink a tall, cool one while playing—to more accurately simulate the real experience, of course.

Ultimate Hunt Challenge

We've played enough first-person shooters to know how to hunt down fleeing opponents, so we expected to instantly kick some game-animal ass. How hard can it be? In a word, very.

Hunting a turkey is very, very different from playing *Unreal Tournament*. For example, you can't just run into the forest with guns blazing, because animals run away at the sound of gunshots (wimps!). In this game, you must be extremely quiet to keep from scaring off your prey. Thus, the entire game boils down to this simple formula: locate animal; creep, creep, creep; BANG! If you can get close enough to the deer, pheasant, or turkey without scaring it away, getting the kill is as simple as aiming your weapon.

Each of the three hunting "challenges" (turkey, deer, pheasant) are played out in similar environments, with the same scenarios (i.e., creep up to animal and kill it). Overall, this game was awfully boring—except in the deer challenge, where we had the option of rubbing buck urine all over ourselves.

NASCAR 2000

If there's one activity that really gets our pulse pounding, it's driving around in circles. Like a cat chasing its own tail, we just love going round and round to the point of nausea. So you can imagine how much we enjoyed *NASCAR 2000*, a game in which you pick a car and go round and round until the game ends.

The graphics are the best of the bunch in this roundup; specular lighting on the cars delivers a realistic, glistening sheen as they pass under light sources. But gameplay, as alluded to before, is monotonous. Plus, we had a hard time keeping our car on the track, due to its propensity to spin out of control upon entering a track's banking, and we didn't enjoy trying to maintain control of the vehicle while the other cars lapped us. If we ever get a hankerin' to play another driving game, we'll stick with the *Need for Speed* series.

—Josh Norem

We never imagined we'd enjoy PC fishing, but *Championship Bass* caught us hook, line, and sinker.

CHAMPIONSHIP BASS — 8
$20 | EA Sports
Buy www.SeeMeBuyMe.com
877.751.7467 ID#0712

ULTIMATE HUNT — 6
$30 | EA Sports
Buy www.SeeMeBuyMe.com
877.751.7467 ID#0713

NASCAR 2000 — 4
$40 | EA Sports
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Retrospect Express Backup

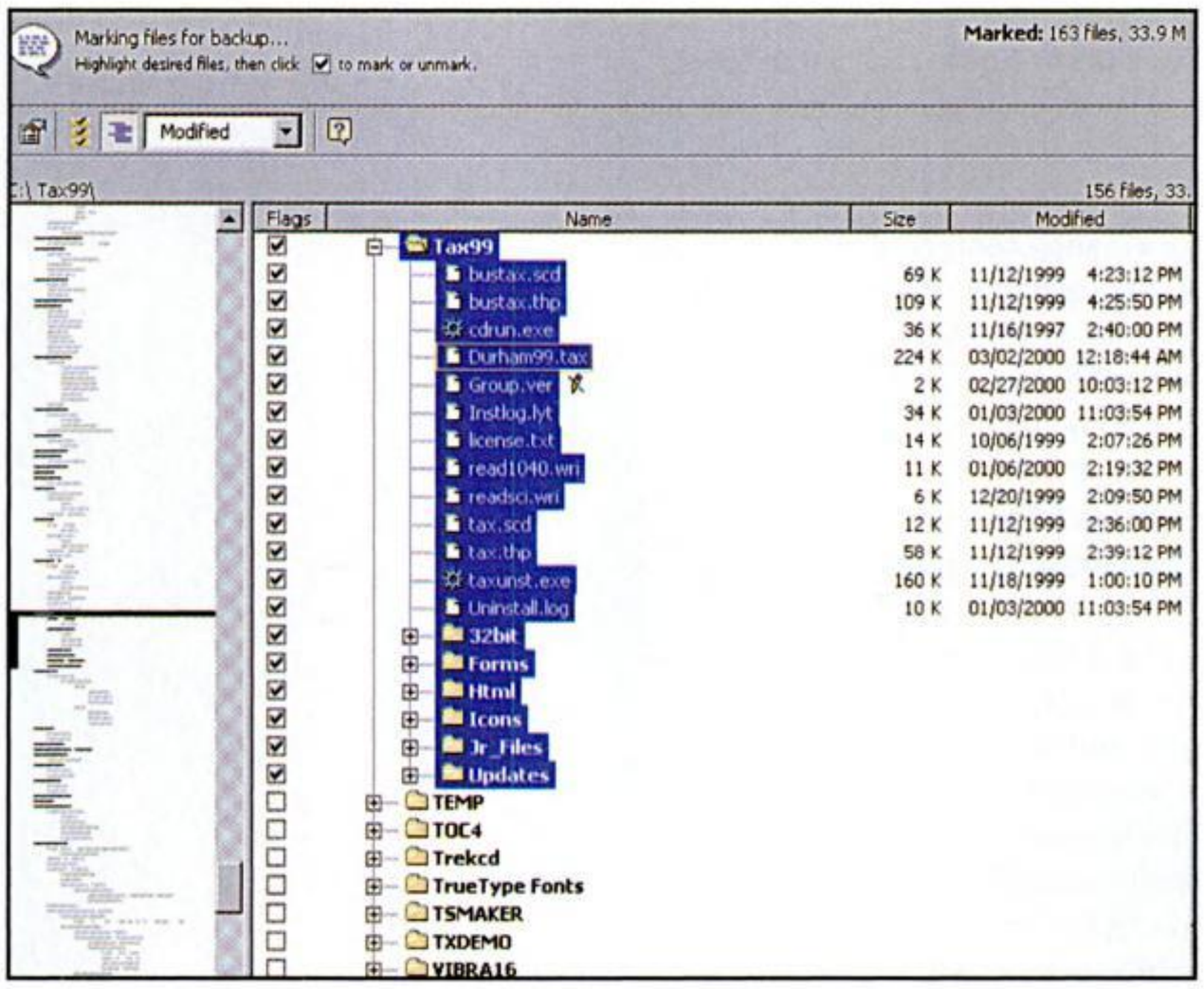
THERE'S NO NEED TO BACK AWAY FROM BACKING UP

Dantz's *Retrospect Express Backup* (**www.dantz.com**) is the Volvo of Windows backup software—not the fastest, and not the sexiest, but the one you can count on in a crash. *Retrospect* brings tape-style backup to CD-R/RW and other removable media, and goes the extra mile by including automated backup scripts and the ability to incrementally save only files that have changed since your last backup.

When we first ran the program, we selected the disks and files we wanted backed up and where we wanted them backed up to (CD-RW), then inserted blank disks when prompted. Unless you're Tom Halfhill (see Fast Forward, April 2000), you'll almost certainly need multiple disks to fully back up your computer—ours required eight. Subsequent backups were a breeze, however. We scheduled them, and they occurred automatically, took only a few minutes, and were simply appended to our last CD-RW.

Retrospect handles incremental backups intelligently, so you can restore files in just one step, regardless of how many incremental backups you've made since your last full backup. The one-step restore from multiple incremental backups reduces the frequency of full backups, a time-consuming chore that keeps most of us from backing up our data as often as we know we should.

Retrospect's second innovation is a sophisticated restore strategy. Each time you back up your computer (full or incremental), the software takes a snapshot of your system. This allows you to restore your computer to the state it was in at the time of any given backup—a great feature if your drive is nearly full and you frequently download and delete files. Other backup programs would blindly restore those transient files, filling up your disk before the restore was complete.



***Retrospect*'s file tree gives you a visual display of files that have been backed up, and lets you easily select individual files for restoring or saving.**

However, this sophistication comes at a price. We found the snapshot to be a time-consuming task for backing up just a few quick files; if you just want to copy a few files to a CD-RW, a "drag-and-drop" utility like *DirectCD* is a better choice. But restoring individual files or folders was quick and easy, with options to overwrite existing files or move backed-up files to a new folder.

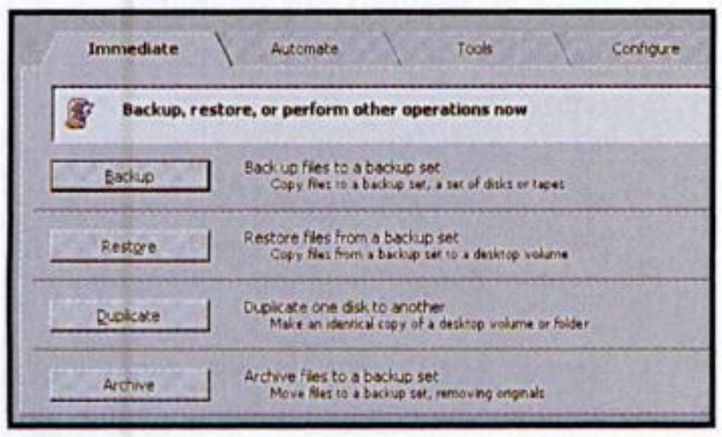
In addition to its slick restore options, *Retrospect* supports multiple backup sets of the same data. It keeps track of which files have been backed up and to where, so you can automatically save the same file incrementally to multiple backup sets. This allows you to keep one backup set on hand for accidental deletions, and another safely stored elsewhere in case of theft or disaster.

For unattended backups, *Retrospect* provides the EasyScript Wizard. More than just a scheduler, EasyScript uses your answers to a few simple questions to create an entire backup strategy (media rotation and retirement, in addition to backup scheduling). We like that the resulting scripts can be easily modified with a few clicks.

Our biggest quibble with the program is that it lacks a tool for creating an emergency bootable CD. Instead, disaster recovery (a full restore to wiped disks) requires first installing Windows to a temporary directory, then installing *Retrospect*, and then finally restoring files from backup.

No one can make you back up your files, but *Retrospect Express Backup* does the next-best thing—it eliminates the excuses *not* to do so.

—Mark A. Durham



Tabs and buttons. Point and click. Ho hum. It gets the job done, though.

PLUSES
- One-step incremental restores
- Supports multiple backup sets
- Flexible automated scripting

MINUSES
- Snapshot can be slow
- No emergency bootable CD

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Sony DCM-M1 AV Recorder

NEWER DOESN'T ALWAYS MEAN BETTER

From the MusicClip to Slimtop PCs, Sony never ceases to build products that look impressive but turn out to be impractical. Unfortunately, the DCM MiniDisc Recorder (**www.sony.com**) continues this legacy, bringing several innovative features to the digital video realm, but sacrificing affordability and compatibility.

Most surprising is the camera's reliance on Sony MiniDiscs for storage. This system combines native MPEG2 encoding and ATRAC audio extraction, and has been dubbed "Video MD" by Sony. The technology used to write to the discs is similar to CD-RW technology: A laser initiates a phase change in the disc's media. And since there's no contact between moving parts and the disc (as is the case with DV tape running through heads), there's no degradation in image quality until the disc has been used approximately one million times.

Sony offers the first-ever MiniDisc camcorder—for a price.

PLUSES
- MPEG2 recording
- Image stabilization is amazing
- No degradation of quality with the MiniDisc

MINUSES
- Blocky and uncomfortable to use
- No FireWire
- Too pricey

THE SPECS

OPTICAL ZOOM	10x
DIGITAL ZOOM	40x
CCD	1/4-inch, 680,000 pixels
LENS	1-inch
TAPES	MiniDisc (MD Data2 Media)

One major benefit of this technology is easy navigation. Just as CDs let you jump from song to song, MiniDiscs eliminate the need to fast-forward or rewind a tape to find a specific selection.

Further aiding navigation is the camera's ability to split a video stream into separate tracks each time the camera is paused or another photo is snapped. Once you're finished shooting, all tracks (video clips) are displayed on a color LCD touchpad that swings out from the camera's side. A Java 2.0-based menu displays your tracks in an easy-to-read list, and track selection is accomplished with a nifty stylus pen. Just tap the pen on the track you want to play with, and you're greeted with a robust collection of editing options.

The DCM-M1 is equipped with a .25-inch CCD that offers an unbelievable 680,000 pixel-pickup. Its 10x optical zoom and 40x digital zoom also performed impressively, yielding shots free of gross artifacting or heavy blurring.

But as we mentioned before, all of these features go head-to-head with serious drawbacks. Our biggest complaint is that this is a digital video camera, yet it has no FireWire port. Isn't that against the law or something? Sony chose instead to include an Ethernet port, letting you pipe video through an assigned IP address and display it through a web browser. The process is laborious, to say the least; we're not interested in completing six steps, including Ethernet negotiations, just to get at our video—it's too much work.

The Video MD format is also a letdown—MiniDiscs hold just 20 minutes of video footage per disc. The image quality is superb, and you can edit the hell out of your footage right on the camera, but what are we going to shoot that's only 20 minutes long? Even most dance recitals and graduation ceremonies run longer than 20 minutes. Recording in native MPEG 2 format is a huge leap forward, but 20 minutes is a rip-off. The 4,500 still-shot capacity is appealing, but we've seen better-quality still images from stand-alone digital cameras that cost far less.

Our overall impression of the DCM-M1 is one of bewildered interest. We can appreciate the innovation of the slick new technology, and this camera has features we'd kill to see on a regular DV cam (such as the touch-pad screen), but we can't see the point of shelling out so many sheckels for a few new features—especially when there's no guarantee that the Video MD format won't go the way of the Divx.

—Geoffrey Visgilio

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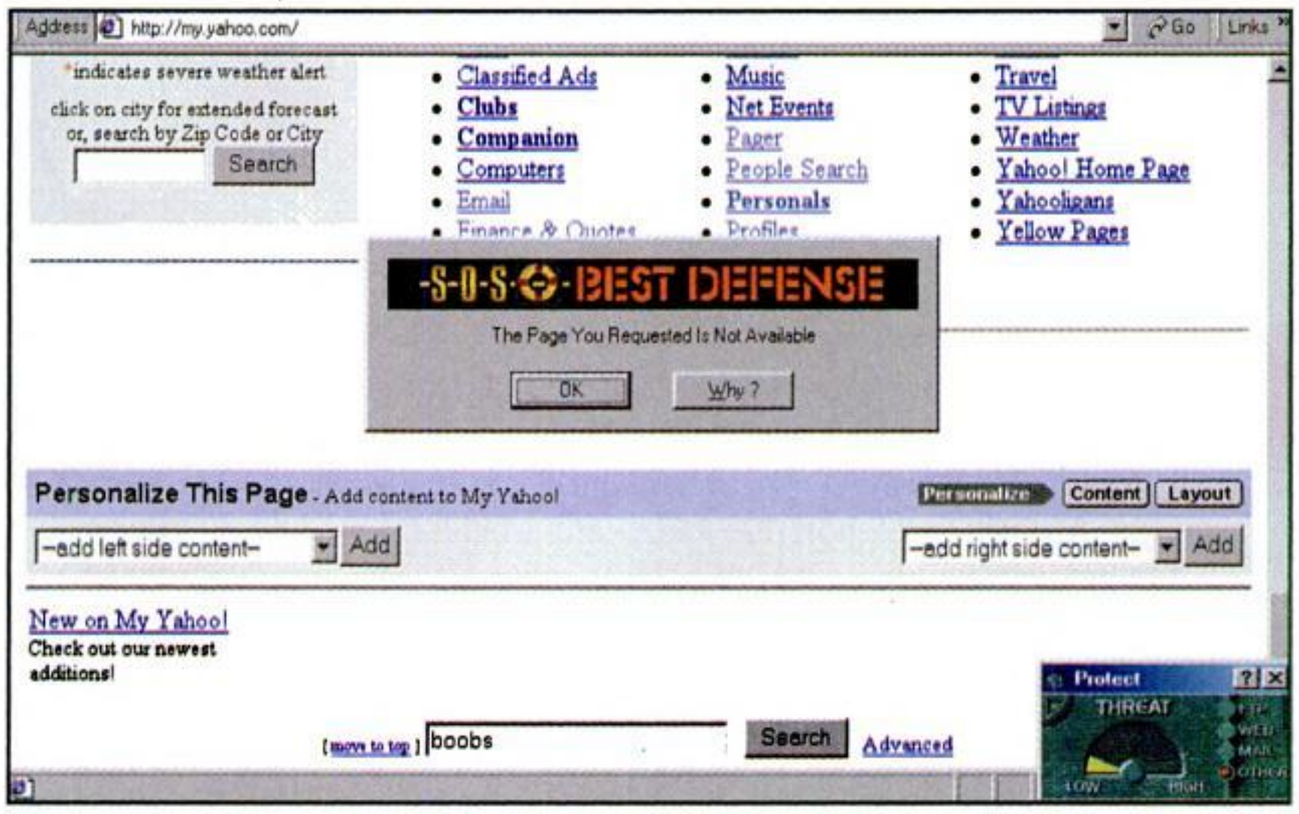
Protect Yourself

PRIVACY APPS TO MAKE YOU FEEL SECURE

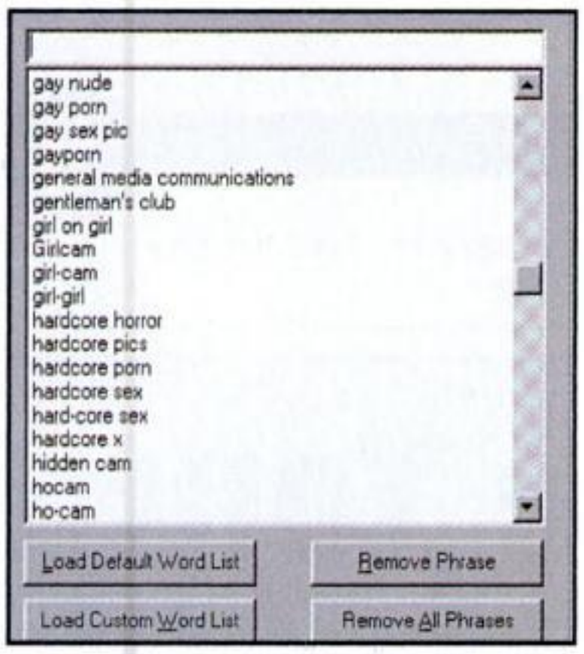
Not everyone needs a full personal firewall to feel safe on the net. For this roundup we pitted McAfee's *Internet Guard Dog* (**www.mcafee.com**) against Best Defense (**www.sosbest defense.com**). If you're concerned about privacy or protecting your kids from porn, one of these less expensive options could be just what you need.



Our quest for 'boobs' was swiftly halted by both programs.

Blockage

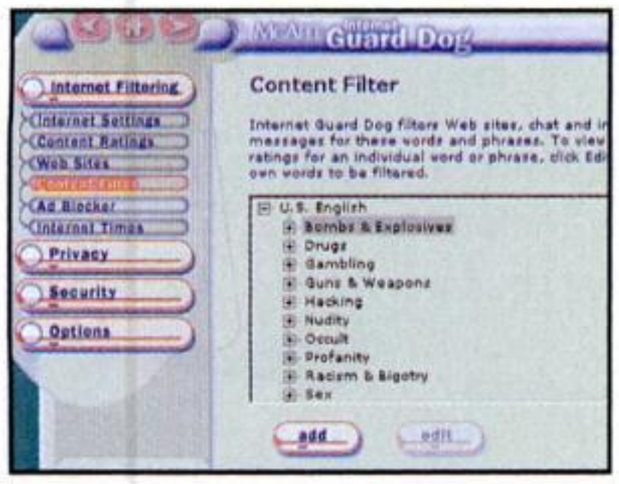
Internet Guard Dog and *Best Defense* are both adept at blocking incoming and outgoing information. On medium and high level settings, *Best Defense* keeps web cookies off your PC's plate; *IGD* does the same, but also learns the sites from which you want to accept cookies. At first, *IGD* barks at every major site you visit,



Don't let your kids get a hold of either programs' restricted list—what they read there will do more damage than most offensive web sites.

but you can teach it how to hunt by telling it to always or never accept cookies from oft-visited sites.

Controlling the information that leaves your PC may be even more important than blocking incoming



In addition to sex sites, *Internet Guard Dog* lets you filter guns and ammo, hate sites, and the occult.

nuisances. Both *Defense* and *IGD* let you input such personal information as your name, address, and credit card numbers, and keep you informed about nefarious applications that are attempting to disseminate this data online.

Each app's included virus scanner is a nice extra. However, *IGD* offers a smooth, seamless update process that virtually ensures its virus scanner is always up-to-date. The eSafe utility included with *Best Defense* requires a more hands-on update process.

Brita for the Web

In addition to keeping unseen info from entering and exiting your PC, both *Best Defense* and *IGD* offer different levels of web filtering, so you can set up accounts for the kiddies that will turn a Pamela Lee Net into a Minnie Pearl Wide Web.

Web filtering is a vague science at best, and both programs struggle a bit with the finer points. Each was able to prevent such PG-13 searches as 'boobs' and 'sex' (hey, we had to test them thoroughly), but *IGD* kept us from visiting a tech article on hackers (who knew that porn freaks also used the term 'back orifice'?), and *Best Defense* kept us from viewing Real.com's preview of the *Sports Illustrated Swimsuit Video*, even after we removed 'swimsuit model' from the program's list of restricted terms.

There Shall Come a Firewall

Best Defense deserves a plus for bundling a personal firewall, but configuring the firewall is about as easy as performing an appendectomy—on yourself. Unless you've got a Network Admin degree, you're better off with an easier personal firewall, such as Zone Labs' free *ZoneAlarm* (**www.zonelabs.com**).

Neither *Best Defense* nor *IGD* afforded much protection when we visited Gordon Research's Shields Up! program at **www.grc.com**. The online scanner rooted around our system like a pig in a truffle patch, and all we could do was watch in horror. McAfee will soon offer *Internet Guard Dog Pro*, which, for $49, will include a full version of the McAfee firewall.

Both *Defense* and *IGD* offer packages with adequate features, but *IGD's* greater ease-of-use makes us recommend it over *Best Defense*. Or, better yet, wait for McAfee's *IGD Pro*.

—Joel Strauch

BEST DEFENSE
PLUSES
Not too obtrusive
MINUSES
Firewall sucks
Difficult to configure

GUARDOG
PLUSES
Intuitive
Better virus scanner than *BD*
MINUSES
No firewall
That damn barking

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FireWire Adapter Kit

HOT-SWAPPING ON THE CHEAP

THE SPECS

MAX TRANSFER RATE
50MB/sec

MAXIMUM DEVICES
63

THE BUNDLE
PowerQuest DataKeeper I Three-port 1394 card I Two-port external drive enclosure I Two 1394 cables

PLUSES
Great performance
Low price

MINUSES
No support for *Premiere*

Enhanced IDE and consumer SCSI setups have always been missing one particular feature—hot swapping. Until now.

Thanks to this kit from ADS, you can turn any EIDE drive into a hot-swappable FireWire drive. The Pyro kit is an external drive enclosure with room for a single 3.5-inch EIDE drive or a full-size EIDE 5.25-inch optical drive, such as a DVD or CD-RW drive. Relying on the hot-swapping, plug-and-play capabilities of IEEE-1394, the Pyro kit allows you to add or remove CD-ROMs or hard drives at will.

An ADS three-port 1394 PCI card provides the FireWire service. Don't confuse this card with the P.O.S. ADS card we reviewed in Oct of 1999. Since then, the chipset has been revved twice, and several driver revisions have come along. ADS also says it has fixed previous incompatibilities with Digital Video cams, and will offer support for *Premiere* when Adobe ships the next version.

But the DV capture aspect is really just a bonus—this kit is marketed strictly as an external 1394 storage device. Another bonus is the included OEM version of PowerQuest's *DataKeeper*, for automated backups.

The Pyro kit's performance is excellent; the IEEE connection affords burst rates on par with current 7,200rpm hard drives and older SCSI devices. For kicks, we connected several DV cams and cut a few videos with MGI's *VideoWave III*—operation was trouble-free.

The Pyro kit lets you connect and hot swap up to 63 devices, and offers IEEE-1394 connectivity. It also does the dishes.

As an alternative to ultra-expensive SCSI, the ADS Pyro kit is a worthy and cost-effective solution for external drives. Plus, you get the bonus of adding 1394 to your PC.

—Gordon Mah Ung

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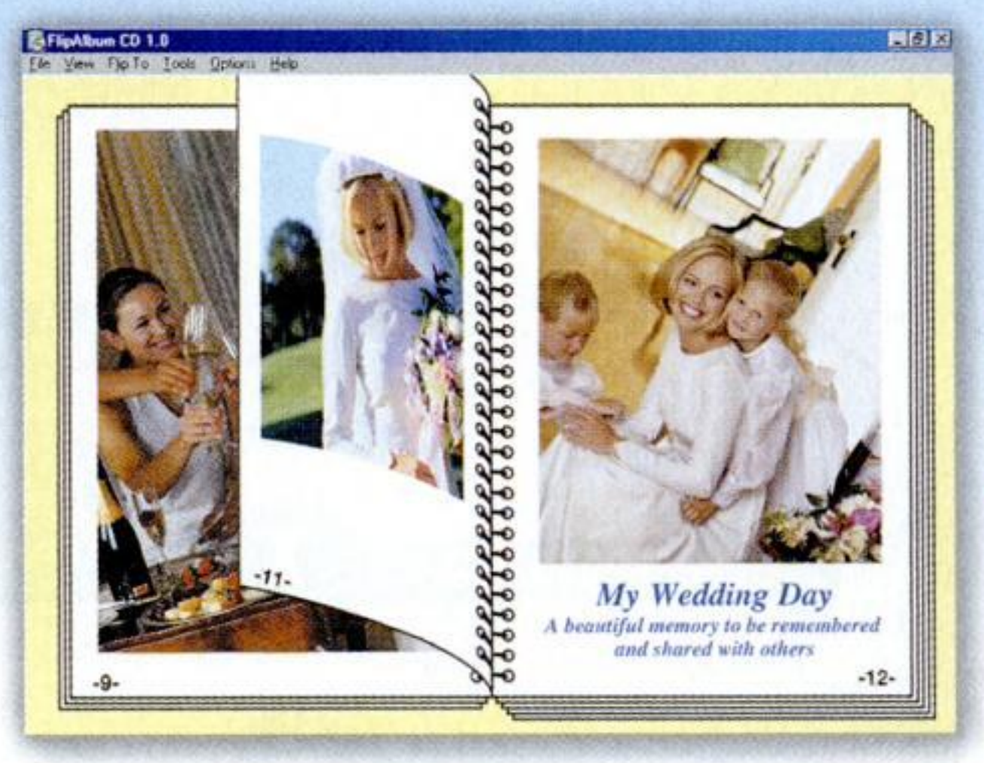

- Create digital photo albums on a CD quickly & easily.*
- Anyone who receives the CD can simply pop it into his/her drive and view it instantly. No downloading or installing of software required.
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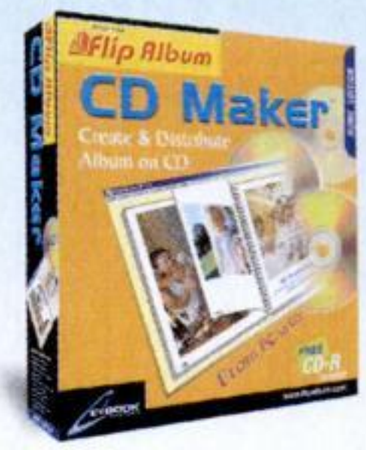

*requires a CD-RW drive for CD-R recording

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Sound Investments

VALUE SOUNDCARDS DELIVER SURPRISING PUNCH

We love a good bargain, but we've learned from experience that low price often means low quality. That said, we didn't expect much from these ridiculously cheap soundcards, which made their respective attributes a pleasant surprise. At $50, **Guillemot's Maxi Sound Fortissimo (www.guillemot.com)** is a sound choice. For $30 more, **Gallant's OdysseySound4 (www.gallantcom.com)** adds some flashy doodads, but its performance is lackluster.

How can cards be sold at these prices? Well, don't expect much of a software bundle. The OdysseySound4 comes with a save-disabled demo of Sonic Foundry's *Sound Forge XP* audio editor, and a simple WAV/CD/MIDI player that crashed our test PC. The player also lacks MIDI controller chasing, so fast-forwarding a MIDI tune can produce ugly results. And fast-forward you will, because Gallant relies on a dull-sounding software synthesizer for MIDI playback. Rounding out the wimpy program package is *ZipMP3*, an expired MP3 player that's no longer supported on the developer's site.

The Fortissimo offers just three apps, but one is Sonic Foundry's excellent *Acid DJ* music-creation program. You also get a spartan

The OdysseySound4's generous hardware add-ons can't save it from mediocrity.

WAV/CD/MIDI player, and a silly program that transforms MIDI files into robotic or pianistic ditties.

Both cards' hardware offerings are more promising. Both produce clean, four-speaker audio (though CDs don't play through the rear speakers on the Fortissimo). And digital audio outputs are a real plus at this price.

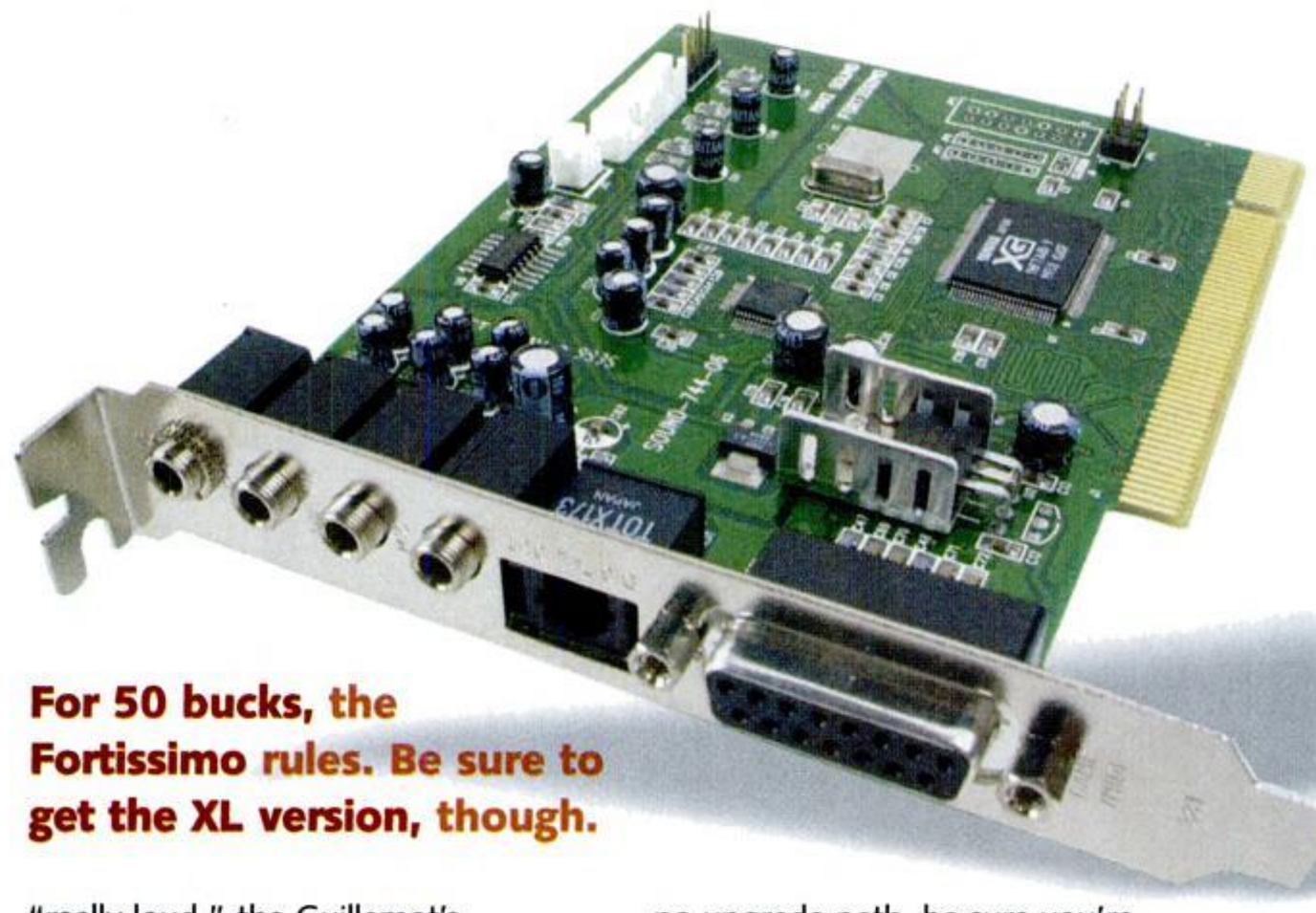
Though "fortissimo" is Italian for "really loud," the Guillemot's analog output was actually on the quiet side. It shrank next to the amplified outputs on the OdysseySound4, though that card's bundled-in 2-inch speakers are among the worst we've ever heard. Gallant does earn points for including an external volume control, though.

The Fortissimo uses the Sensaura 3D audio format, which helped Diamond's Monster Sound MX400 score an 8 in our April 2000 3D soundcard shootout. In contrast, the OdysseySound4 employs QSound Q3D, which we found far less compelling. You can add reverb via the QSound control panel, but the effect is like pulling a metal bucket over your head.

Guillemot plans to stick a software DVD player and an MP3 encoder in the Fortissimo package and rename it Fortissimo XL. The price won't change, and since there's no upgrade path, be sure you're getting the latest version. With the XL software, the Fortissimo will match the Diamond MX400 feature for feature—at 63 percent of the cost. And the Fortissimo's Yamaha synth trounces the MX400's ghastly ESS. If the software works, the Fortissimo XL could probably earn a 9 verdict.

The OdysseySound4 is worthwhile if you need optical and electrical S/PDIF outputs, but it's otherwise undistinguished. Still, these cards prove you don't have to pay through the nose to please your ears.

—David Battino



For 50 bucks, the Fortissimo rules. Be sure to get the XL version, though.

MAXI SOUND FORTISSIMO — **7**

$50 | Guillemot
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ODYSSEYSOUND 4 — **5**

$80 | Gallant Computer
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FORTISSIMO

PLUSES
Dirt cheap
Sensaura 3D

MINUSES
Stunted media player

ODYSSEY

PLUSES
Dual digital outputs
Remote control

MINUSES
Weak 3D and synthesizer

DARE TO COMPARE

MANUFACTURER	GUILLEMOT	GALLANT
Model	Maxi Sound Fortissimo	OdysseySound4
Audio Chip	Yamaha YMF744	LEO510
Hardware 3D	Sensaura, DS3D	QSound Q3D, DS3D
Software 3D	A3D 1.0, EAX 2.0	A3D 1.0, EAX 1.0
Inputs	Line, mic, CD (analog)	Line, mic, CD (analog/digital)
Speaker Support	Two, four, headphones, optical S/PDIF	Two, four, headphones, RCA, and optical S/PDIF
MIDI	64-voice hardware XG synth, DLS, DirectMusic acceleration	64-voice software XG synth

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Web Tools for Beginners

WEB SITES ARE BETTER WITH SOME SPICE

In this world of advanced HTML editors, XML, JavaScript, and Cascading Style Sheets, it's difficult to keep things simple when designing a web page. Most who are intent on building a web site have played with *Photoshop*, HTML, or a WYSIWYG editor, but many want such options as special photo-tweaking effects, animated GIFs, and simple 3D modeling, without the prohibitive cost or high learning curve of advanced programs. We've rounded up three programs that promise to jazz up your web site with relative ease.

KPT 6
PLUSES
Easy to use
Lots of options
Each filter has its own interface

MINUSES
Pricey

EMOTION
PLUSES
Special effects are on par with more expensive GIF builders
Easy to use

MINUSES
Juvenile interface

KAZOO 2.0
PLUSES
Cheap
Professional effects
Easy to use

MINUSES
Advanced features are restricted to software developers
Ambiguous pricing scheme

***KPT 6* offers amazing distortion and positional lighting effects.**

KPT 6

The newest installment of the *Kai's Power Tools* family, *KPT 6* (**www.metacreations.com**) is simply outstanding. It's sold as a set of eight proprietary plug-ins (with two freebies thrown in) that integrate with the existing filter palette of most major graphics apps. (In other words, you need *Photoshop*, or a compatible host program such as MetaCreations' *Painter*, to use *KPT 6*.)

KPT 6 is a welcome addition to *Photoshop's* filters, delivering a special effects palette suitable to web developers who are looking to tweak their GIFS, or artists striving to add pizzazz to photos.

Each plug-in is applied using an intuitive, customizable interface, rather than the bare-bones control box found in most filters. Unlike apps that let you select a plug-in and tweak a single variable, *KPT 6* lets you adjust so many settings, you feel as though you're working within a separate program rather than in a program's standard filters menu. Filter options include various color schemes, skin textures, and sky effects.

Even if you're new to web development or graphic design, *KPT 6's* filter interface will make you feel right at home. Each filter has its own set of global options (affecting the entire project) and local options (pinpointing a specific part), and includes a set of easy-to-use tools and presets. Each filter also comes with preview options, and some filters have effects that can be saved in a series of frames and exported as short animations. Whew.

The only thing *KPT 6* doesn't have is what every version prior to it had: all the previous filters. When you bought *KPT 4*, you also got versions *3*, *2*, and *1*. Not so this time, Bub. It's no skin off our noses, though; with filters this powerful and creative, we'll let it slide.

Of the bunch, the gel filter was our favorite. It allows you to place colored gels over an existing picture, or create a stand-alone illustration of different gels combined into a collage. The gels look like a mix of plastic and metal with bubbles trapped beneath. You can adjust their size, transparency, and even where the sources of light come from, to create dazzling effects.

Another feature that's sure to be a winner with photographers is the Lens Flare filter, which simulates flares from 35MM and other cameras, and from wide-angle lenses. You can even adjust the color of coronas and light sources. Combine the Lens Flare with the Equalizer filter, which uses anti-aliasing and a sharpening engine to enhance pics when they're blown up, and you could spend hours making digital shots look like they were taken with a traditional SLR camera.

For the faithful web developer, *KPT 6* includes a bonus Scenebuilder 3D filter that lets you create and export 3D images into 2D icons. There's also a Goo filter for smudging and twirling photos; a Materializing filter that creates textures; a Turbulence filter for creating ripples and distortions; a Reaction filter that applies organic textures, such as sea coral, to your work; a Projector tool for perspective and tiling effects; and SkyEffects, which uses a raytrace engine to make realistic or surreal skies, complete with clouds and sun or moonlight. It's everything a multimedia hound could ask for.

Emotion 3D

Emotion 3D (**www.anarkmedia.com**) is easily the most user-friendly program that we've ever seen for making animated GIF and JavaScript mouseovers. But it's got more than

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two tricks up its sleeve—you can also use it to turn 2D images into 3D models that are so easily exported to the web, it may insult your intelligence.

To make animated GIFs, simply follow a cartoonish wizard while the application does all the coding in realtime, behind the scenes. This realtime coding lets you view changes in a preview mode, so you can decide whether the changes are right for your project before making a commitment. The coding engine displays every change you make to a model, from lighting to motion, and gives you an array of export-to-web options once you're finished.

Making an animated GIF or mouseover requires just eight steps, which are outlined in an über-friendly wizard. You can select an item to animate from an assortment of pre-fabricated objects, animals, and shapes, or import any vector-based image, and the rendering engine will make a "best guess" as to the 3D shape of the object. Once you've imported your image, you can change the lighting position to create a spotlight effect under, over, or around your model; choose from different colored backgrounds; and add special effects such as halos and textures. The animation options are plentiful—you can make objects laugh, run, bounce, or perform just about any other action.

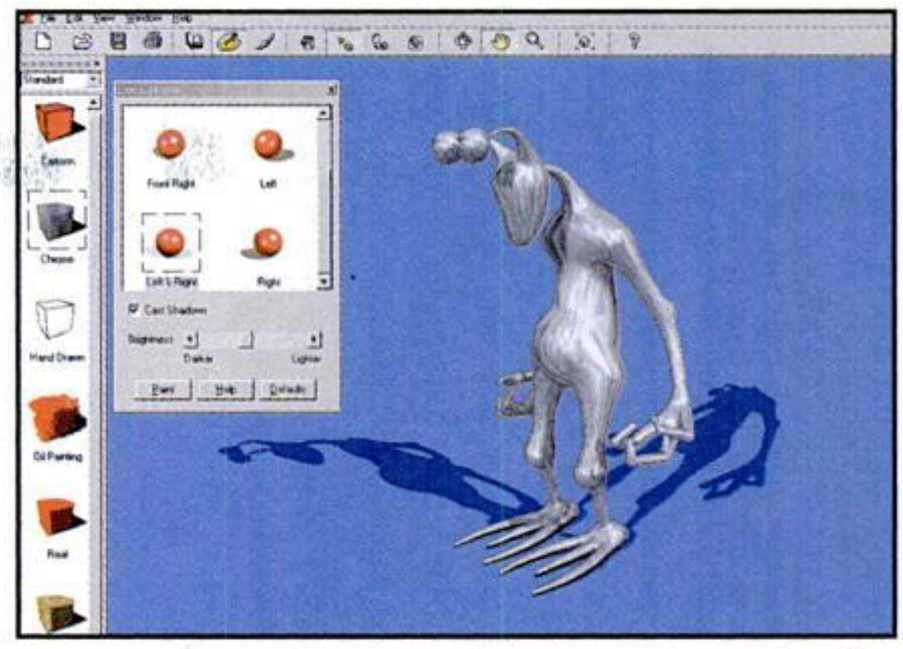
When you've finished your project, simply set your bit depth (the number of colors in the final image), dithering, frame rates, and other export options in the final menu, then export the image. It's that simple.

We recommend *Emotion 3D* for people who want to animate graphics without having to overcome a huge learning curve, but we were a little turned off by the program's juvenile interface.

***Emotion* 3D seems easy enough for a child to use, and that's its downfall. We'll bet a Pokemon version is in the works.**

Kazoo 2.0

Kazoo 2.0 (**www.kazoo3d.com**) is an Active X modeling program designed to bring 3D modeling technology to home users with shallow pockets.



***Kazoo* gives you only a taste with its Viewer; the good stuff is in the developer package.**

Most modeling programs cost more than a Royal Wedding, but *Kazoo* costs just $30, and it gets the job done. Keep in mind, though, that when we say "simple," we mean it. It'll be a cold day in hell before id Software modeler Paul Steed turns to *Kazoo*, but for web jockeys and beginners, it's a great tool.

The package includes a Viewer that's used to create models, and a player that's used to view and distribute them. The Viewer consists of a basic interface through which you can choose a 3D model from a small selection of simple objects. After selecting a model, you can examine it from all angles using a free rotate and zoom tool, ensuring you get the desired perspective and angle for your final picture.

You can tweak the model with a variety of manipulation options, from varied light sources to surface textures such as a faux wood or liquid metal (á la *Terminator 2*). You can save your work as a *Kazoo* document that's e-mailable, and recipients can download the free *Kazoo* Player to view the fruits of your labor.

Thankfully, *Kazoo* doesn't force you to save a project in its proprietary format; you can also export your model as a GIF or JPEG. And you're not restricted to using *Kazoo* models alone—you can import your own photographs to use as backgrounds, though you can't import them as objects to be manipulated.

Because only so many presets are offered, *Kazoo* feels like a one-trick pony before long. But keep in mind that the app is geared toward beginners. For the more advanced modeler, *Kazoo* offers a Toolkit with customizable C++ classes, for more powerful integration with other rendering applications. An Encoder program is also available; it converts your own 3D models into the *Kazoo* format for manipulation. As an added bonus, free updates to *Kazoo* are available via download, including additional models and texture styles.

A big drawback is that, while *Kazoo* is accessible to everyone, the really useful tools are available only in the developer toolkit. Even worse, the customer service rep we spoke with claimed that the price of said toolkit varies depending on what the application will be used for. We couldn't even get a ballpark figure and we're a magazine! So the average person won't be able to tap the product's full potential without doing substantial legwork.

—Geoffrey Visgilio

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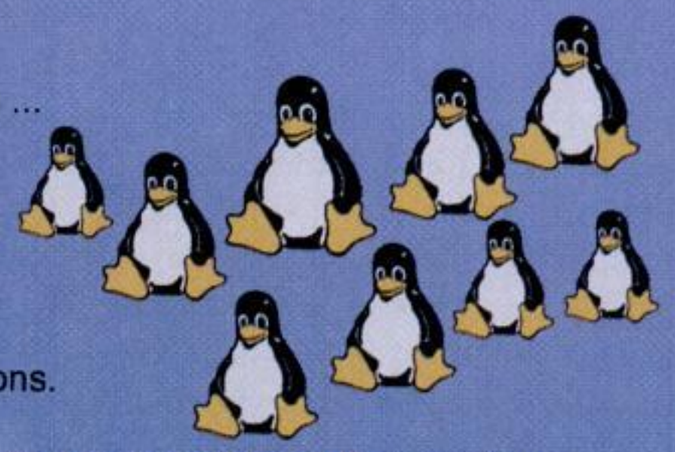

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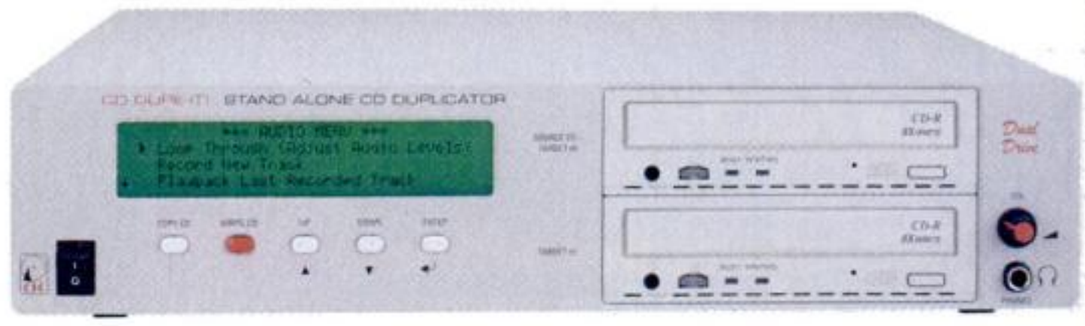

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P-III 850	$863	$689
P-III 866	$889	$849

AMD Processors
K-6-2 450 MHz. $59
K-6-2 500 MHz. $65
K-6-2 550 MHz. $89
K7 550 MHz. $148, K7 650 MHz. $181
K7 700 MHz. $203, K7 750 MHz. $268
K7 800 MHz. $343, K7 850 MHz. $460
K7 900 MHz. $637, K7 950 MHz. $730
K7 1000 MHz. $ See Web

P-3 Heatsink & Cooling Fan $22
AMD K6-2/3 Heatsink & Fan $12
AMD K7 Heatsink & Fan $18

AMD Bare Bones Systems

AMD K6 Bare Bones Systems

Specifications:
DFI-K6-BV3+ Motherboard w/ 2 megs of cache
Mid Tower AT Case w/ 250 watt power supply
AMD Processor of your choice
System is assembled and burned in for 48 hours

AMD K-6-2 450 MHz. $199
AMD K-6-2 500 MHz. $209
AMD K-6-2 550 MHz. $223

Heatsink/Cooling fan unit $12

AMD K7 Bare Bones Systems

AMD K7 Athlon Bare Bones Systems

Specifications:
FIC SD-11 Motherboard
Mid Tower ATX Case w/ 300 watt power supply
AMD Processor of your choice
System is assembled and burned in for 48 hours

AMD K-7 700 MHz. $467
AMD K-7 800 MHz. $624
AMD K-7 900 MHz. $905
-See More listings on our website-
Heatsink/Cooling fan unit Included

Sound Cards

Sound Blaster Live Plantinum $182
Sound Blaster Live X-Gamer $95
Sound Blaster Live MP3+ $94
Sound Blaster Live Value $59
Diamond Monster MX300 $54
Diamond Monster MX 400 $58
Sound Blaster 16 PnP $25

Cases/Chassis

Model 6306 ATX Mid Tower 250 watt $79
Model 6306 ATX Mid Tower 300 watt $99
Model 9106 ATX Full Tower 300 watt $125
Enlight Mid Tower ATX 250 watt $79
848C AT Mid Tower 250 watt $33

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Modems

3Com/USR 56k v.90 Internal PCI WinModem $55
3Com/USR 56k v.90 Int. PCI HardwareModem $66
3Com/USR 56k v.90 Internal ISA $82
Diamond Supra Max 56k v.90 Internal PCI $33

Software

MS Windows 98 full version 2nd edition $105
MS Windows 2000 Professional full version $189

Speakers

Cambridge PC Works 4 point surround FPS 2000 Dig. $187
Cambridge Desktop Theater 5.1 Digital $286
Altec Lansing ACS54 40-watt 4 speaker w/sub woofer $78
Eastern/Boka 3003, 360 watt $42
Basic Speaker 120 watt $15

product prices change daily, please see our website

Ship to address: 1927 Harbor Blvd. #395, Costa Mesa, CA 92627, Telephone # 800-798-1880, Fax # 949-646-7029
30 day return period for refunds from purchase date, after 30 days only warranty exchange, no returns on software. All returns require an RMA # please email or g
to web to get an RMA #, shipping is non refundable, complete return policy can be found on our website.

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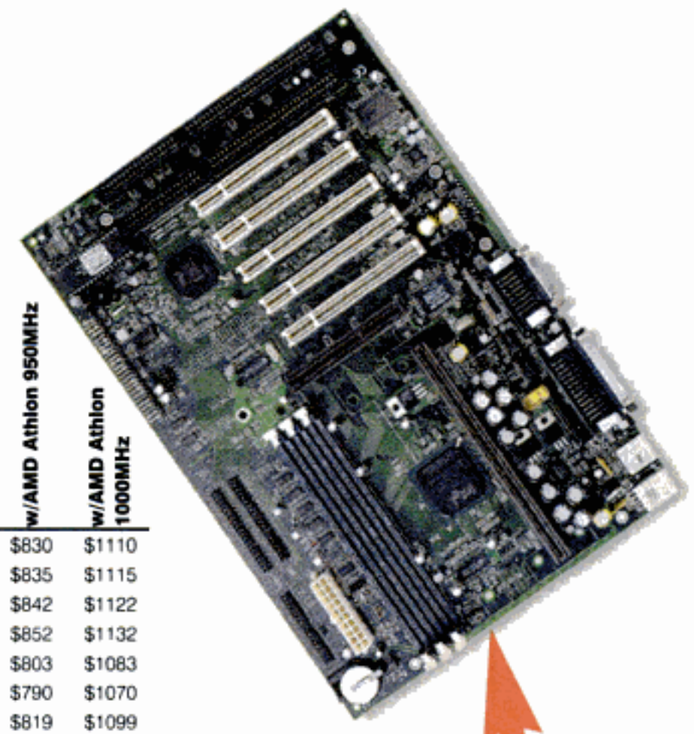
ABERDEEN 1

MOTHERBOARD GEEK HEAVEN!

Super7™

	Part Number	Chip Set	L2 Cache (KB)	Maximum Memory (MB)	168-pin DIMM Sockets	72-pin SIMM Sockets	Flash BIOS	Integrated Audio	Integrated Controller	PCI Slots	ISA Slots	AGP Slot	Format	Manufacturer's Warranty	Motherboard Only	w/AMD-K6-2/500	w/AMD-K6-2/550	w/Intel® Pentium® MMX™ 233MHz
EPoX EP-MVP3C2	*MB5406*	VIA Apollo MVP3	512	384	3		Award		UltraDMA/66	4	2	1	Baby AT	2 Yrs.	$81	$140	$151	$126
EPoX EP-MVP3G5	*MB5405*	VIA Apollo MVP3	2048	384	3		Award		UltraDMA/66	5	2	1	ATX	2 Yrs.	$106	$165	$176	$151
FIC VA-503+	*MB5211*	VIA Apollo MVP3	1024	512	2	4	Award			3	3	1	Baby AT	1 Yr.	$76	$135	$146	$121
Shuttle HOT-591P	*MB5611*	VIA Apollo MVP3	512	256	2	2	Award			3	3	1	Baby AT	1 Yr.	$77	$136	$147	$122
Tyan S1590S Trinity 100AT	*MB5006*	VIA Apollo MVP3	1024	384	3	2	Award			4	4	1	Mini AT	3 Yrs.	$95	$154	$165	$140
Tyan S1598 Trinity ATX	*MB5008*	VIA Apollo MVP3	2048	384	3		Award		UltraDMA/66	5	2	1	ATX	3 Yrs.	$121	$180	$191	$166



Slot A

	Part Number	Chip Set	Maximum Memory (MB)	168-pin DIMM Sockets	Flash BIOS	Bus Frequency	Integrated Controller	PCI Slots	ISA Slots	AGP Slot	Format	Manufacturer's Warranty	Motherboard Only	w/AMD Athlon™ 650MHz	w/AMD Athlon 700MHz	w/AMD Athlon 750MHz	w/AMD Athlon 800MHz	w/AMD Athlon 850MHz	w/AMD Athlon 900MHz	w/AMD Athlon 950MHz	w/AMD Athlon 1000MHz
ABIT KA7	*MB7501*	VIA Apollo KX133	2048	4	Award	200/133	UltraDMA/66	6	1	1	ATX	1 Yr.	$160	$350	$360	$385	$450	$540	$670	$830	$1110
AMI Megathon	*MB7301*	AMD-751 / VIA 686A	768	3	Award	100	UltraDMA/66	5	1	1	ATX	1 Yr	$165	$355	$365	$390	$455	$545	$675	$835	$1115
Asus K7M	*MB7701*	AMD-751 / VIA 686A	768	3	Award	100/120/133	UltraDMA/66	5	1	1	ATX	1 Yr	$172	$362	$372	$397	$462	$552	$682	$842	$1122
Asus K7V	*MB7703*	VIA Apollo KX133	1536	3	Award	200/133	UltraDMA/66	5		1	ATX	1 Yr	$182	$372	$382	$407	$472	$562	$692	$852	$1132
EPoX EP-7KXA	*MB7850*	VIA Apollo KX133	768	3	Award	200/133	UltraDMA/66	5	1	1	ATX	2 Yrs	$133	$323	$333	$358	$423	$513	$643	$803	$1083
FIC SD11	*MB7401*	AMD-751 / VIA 686A	768	3	Award	100	UltraDMA/66	5	1	1	ATX	1 Yr	$120	$310	$320	$345	$410	$500	$630	$790	$1070
Microstar K7 Pro	*MB7202*	AMD-750	768	3	Award	100	UltraDMA/66	6	1	1	ATX	1 Yr	$149	$339	$349	$374	$439	$529	$659	$819	$1099
Shuttle AI61	*MB7901*	AMD-750	768	3	Award	100	UltraDMA/66	5		1	MicroATX	1 Yr	$123	$313	$323	$348	$413	$503	$633	$793	$1073
Tyan S2380 Trinity K7	*MB7000*	VIA Apollo KX133	768	3	Award	200/133	UltraDMA/66	6	1	1	ATX	3 Yrs	$150	$340	$350	$375	$440	$530	$660	$820	$1100

Socket 370

	Part Number	Chip Set	Maximum Memory (MB)	168-pin DIMM Sockets	Flash BIOS	Integrated Audio	Integrated Video	PCI Slots	ISA Slots	AGP Slot	AMR Slot	Format	Manufacturer's Warranty	Motherboard Only	w/Intel® Celeron™ processor 500/A MHz 128K OD 66MHz FSB	w/Intel Celeron 566 128K OD 66MHz FSB	w/Intel Celeron 600 128K OD 66MHz FSB	w/Intel Celeron 633 128K OD 66MHz FSB	w/Dual Intel Celeron 633 128K OD 66MHz FSB	w/Intel Pentium® III 667 256K OD 133MHz FSB	w/Intel Pentium III 733 256K OD 133MHz FSB	w/Intel Pentium III 750 256K OD 100MHz FSB	w/Intel Pentium III 800/EB 256K OD 100/133MHz FSB	w/Intel Pentium III 866 256K OD 133MHz FSB
ABIT BP6 (Dual)	*MB6506*	Intel 440BX	768	3	Award			5	2	1		ATX	1 Yr.	$149	$234	$259	$284	$319	$489	N/A	N/A	N/A	N/A	N/A
ASUS CUC2000	*MB6724*	Intel® 820	1024	4	Award	AC-97		5	1	1	1	ATX	1 Yr.	$169	$254	$279	$304	$339	N/A	$399	$459	$569	$629	$839
EPoX EP-3VCA	*MB6854*	VIA Apollo Pro 133A	768	3	Award	AC-97		4	1	1	1	ATX	2 Yrs.	$105	$190	$215	$240	$275	N/A	$335	$395	$505	$565	$775
Shuttle ME64	*MB6310*	Intel 810E	512	2	Award	Intel 810E	Intel 810E	3			1	Micro ATX	1 Yr.	$116	$201	$226	$251	$286	N/A	$346	$406	$516	$576	$786
SuperMicro 370SCD	*MB6159*	Intel® 820	512	2	AMI	AC-97		5		1	1	ATX	1 Yr.	$144	$229	$254	$279	$314	N/A	$374	$434	$544	$604	$814
SuperMicro 370SEA	*MB6140*	Intel 810E	512	2	AMI	Intel 810E	Intel 810E	6	1		1	ATX	1 Yr.	$134	$219	$244	$269	$304	N/A	$364	$424	$534	$594	$804
SuperMicro 370DLE	*MB6154*	Reliance LE	2048	2	AMI			6	1			ATX	1 Yr	$333	$418	$443	$468	$503	$673	$563	$623	$733	$793	$1003
SuperMicro 370DL3	*MB6155*	Reliance LE	2048	2	AMI			6	1			ATX	1 Yr	$536	$621	$646	$671	$706	$876	$766	$826	$936	$996	$1206
Tyan S1857 Trinity 371	*MB6017*	Intel 440BX	768	3	AMI			6	1	1		ATX	3 Yrs.	$105	$190	$215	$240	$275	N/A	N/A	N/A	N/A	N/A	N/A
Tyan S1854 Trinity 400	*MB6018*	VIA Apollo Pro 133A	768	3	Award			6	1	1		ATX	3 Yrs.	$105	$190	$215	$240	$275	N/A	$335	$395	$505	$565	$775

Slot 1

	Part Number	Chip Set	Maximum Memory (MB)	168-pin DIMM Sockets	168-pin RIMM Sockets	Flash BIOS	Integrated Audio	Integrated Controller	PCI Slots	ISA Slots	AGP Slot	Format	Manufacturer's Warranty	Motherboard Only	w/Intel® Pentium III® 550 512K 100MHz FSB	w/Intel Pentium III 650/667 256K OD 100/133MHz FSB	w/Intel Pentium III 700 256K OD 100MHz FSB	w/Intel Pentium III 733 256K OD 133MHz FSB	w/Intel Pentium III 750 256K OD 100MHz FSB	w/Intel Pentium III 800/EB 256K OD 100/133MHz FSB	w/Intel Pentium III 850 256K OD 100MHz FSB	w/Dual Intel Pentium III 550 512K 100MHz FSB	w/Dual Intel Pentium III 750 256K OD 100MHz FSB
ABIT BE6-II	*MB6508*	Intel 440BX	768	3		Award		UltraDMA/66	5	1	1	ATX	1 Yr	$135	$330	$365	$425	N/A	$535	$595	N/A	N/A	N/A
ABIT BF6	*MB6507*	Intel 440BX	768	3		Award			6	1	1	ATX	1 Yr	$115	$310	$345	$405	N/A	$515	$575	N/A	N/A	N/A
ABIT VA6	*MB6509*	VIA Apollo Pro 133	768	3		Award	AC-97	UltraDMA/66	5	2	1	ATX	1 Yr.	$85	$280	$315	$375	$385	$485	$545	$745	N/A	N/A
ABIT VT6X4	*MB6510*	VIA Apollo Pro 133A	768	3		Award	AC-97	UltraDMA/66	5	2	1	ATX	1 Yr.	$107	$302	$337	$397	$407	$507	$567	$767	N/A	N/A
Asus P2B-DS	*MB6707*	Intel 440BX	1024	4		Award			4	2	1	ATX	1 Yr.	$479	$674	$709	$769	N/A	$879	$939	N/A	$869	$1279
Asus P3B-F	*MB6720*	Intel 440BX	1024	4		Award			6	1	1	ATX	1 Yr.	$133	$328	$363	$423	N/A	$533	$593	N/A	N/A	N/A
Asus P3C2000	*MB6722*	Intel 820	1024	4		Award	AC-97	UltraDMA/66	5	1	1	ATX	1 Yr.	$161	$356	$391	$451	$461	$561	$621	$821	N/A	N/A
Asus P3V4X	*MB6723*	VIA Apollo Pro 133A	1024	4		Award		UltraDMA/66	6	1	1	ATX	1 Yr.	$118	$313	$348	$408	$418	$518	$578	$778	N/A	N/A
EPoX EP-6VBA2	*MB6855*	VIA Apollo Pro 133A	768	3		Award	AC-97	UltraDMA/66	4	2	1	ATX	2 Yrs.	$109	$304	$339	$399	$409	$509	$569	$769	N/A	N/A
FIC KA11	*MB6411*	VIA Apollo Pro 133A	1024	4		Award		UltraDMA/66	5	2	1	ATX	1 Yr	$96	$291	$326	$386	$396	$496	$556	$756	N/A	N/A
Intel L440GX+	*MB6917*	Intel 440GX	2048	4		Intel/Phoenix		Adaptec 2-Ch U2W	6	1		ATX	3 Yrs.	$539	$734	$769	$829	N/A	$939	$999	N/A	$929	$1339
Intel SE440BX-2 "Seattle"	*MB6921*	Intel 440BX	768	3		Intel/Phoenix			4	2	1	ATX	3 Yrs.	$112	$307	$342	$402	N/A	$512	$572	N/A	N/A	N/A
Shuttle AV64	*MB6309*	VIA Apollo Pro 133A	768	3		Award		UltraDMA/66	5	2	1	ATX	1 Yr.	$89	$284	$319	$379	$389	$489	$549	$749	N/A	N/A
SuperMicro PIIISCD	*MB6146*	Intel 820	512	2		AMI	AC-97	UltraDMA/66	5		1	ATX	1 Yr.	$146	$341	$376	$436	$446	$546	$606	$806	N/A	N/A
SuperMicro PIIISED	*MB6142*	Intel 810e	512	2		AMI	AC-97	UltraDMA/66	6			ATX	1 Yr.	$123	$318	$353	$413	$423	$523	$583	$783	N/A	N/A
SuperMicro PIIIDME	*MB6151*	Intel 840	4096	4		AMI	AC-97	Intel PRO/100+	6		1	ATX	1 Yr.	$359	$554	$589	$649	$659	$759	$819	$1019	$749	$1159
SuperMicro PIIIDM3	*MB6153*	Intel 840	4096	4		AMI	AC-97	Adaptec Ultra3/160	6		1	ATX	1 Yr.	$579	$774	$809	$869	$879	$979	$1039	$1239	$969	$1379
SuperMicro P6DGH	*MB6129*	Intel 440GX	2048	4		AMI		Adaptec 2-Ch U2W	9	2	1	Full AT	1 Yr	$809	$1004	$1039	$1099	N/A	$1209	$1269	$1469	$1199	$1609
SuperMicro P6SBA	*MB6120*	Intel 440BX	768	3		AMI			4	3	1	ATX	1 Yr	$98	$293	$328	$388	N/A	$498	$558	N/A	N/A	N/A
SuperMicro P6SBU	*MB6128*	Intel 440BX	1024	4		AMI		Adaptec U2W	4	3	1	ATX	1 Yr.	$329	$524	$559	$619	N/A	$729	$789	N/A	N/A	N/A
Tyan S1854 Trinity 400	*MB6018*	VIA Apollo Pro 133A	768	3		Award		UltraDMA/66	6	1	1	ATX	3 Yrs.	$105	$300	$335	$395	$405	$505	$565	$765	N/A	N/A

Slot 2

	Part Number	Chip Set	Maximum Memory (MB)	168-pin DIMM Sockets	Flash BIOS	Integrated Audio	Integrated Video	Integrated Controller	Integrated Networking	PCI Slots	ISA Slots	AGP Slot	Format	Manufacturer's Warranty	Motherboard Only	w/Intel® Pentium III® Xeon™ 550MHz 512K 100MHz FSB	w/Intel Xeon 550MHz 1M 100MHz FSB	w/Intel Xeon 550MHz 2M 100MHz FSB	w/Dual Intel Xeon 550MHz 512K 100MHz	w/Quad Intel Xeon 550MHz 512K 100MHz	w/Intel Xeon 700MHz 1M 100MHz FSB	w/Intel Xeon 700MHz 2M 100MHz FSB	w/Intel Xeon 800MHz 1M 100MHz FSB
SuperMicro S2DM3	*MB6156*	Intel 840	4096	4	AMI	AC-97		Adaptec Ultra3/160m	Intel PRO/100+	6		1	ATX	1 Yr.	$676	$1776	$3006	$5016	$2876	N/A	$2076	$3026	$3046
SuperMicro S2DME	*MB6160*	Intel 840	4096	4	AMI	AC-97			Intel PRO/100+	6		1	ATX	1 Yr	$446	$1546	$2776	$4786	$2646	N/A	$1846	$2796	$2816
SuperMicro S2DG2	*MB6136*	Intel 440GX	2048	4	AMI			Adaptec 2-Ch U2W		5	2	1	ATX	1 Yr	$549	$1649	$2879	$4889	$2749	N/A	N/A	N/A	N/A
SuperMicro S2QR6	*MB6190*	Reliance HE	16384	16	AMI			AIC-7899 2-Ch Ultra160	Intel 82559	8			SWTX	1 Yr.	$2732	$3832	$5062	$7072	$4932	$7132	$4132	$5082	$5102

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- Clone over 800 MB/minute
- Clone from 1 to 15 drives at once
- Master & target drives can be of different size, brand and model
- Master drive can hold up to 24 partitions
- Selective partitions: select one, some or all
- Bi-directional data transfer for forensic applications
- Comprehensive data recovery and drive wipe to DoD specs

1 Source → 1 Target

OMNICLONE SOLITAIRE

The Logicube OmniClone Solitaire is one of the most advanced one-to-one drive duplication solution on the market today.

- Single target, IDE hard drive to hard drive duplication
- Portable—Smallest unit on the market
- Data transfer speeds exceed 800 MB/min
- Master & target drives can be of different size, brand and model
- Master can hold up to 24 partitions
- Selective partitions - Choose one or more partitions to copy
- Reverse data transfer - clone from target to master
- Any operating system—Scales FAT16, FAT32, and NTFS
- Comprehensive diagnostics features - data recovery, drive wipe, and scanning
- Clone both ways thru a parallel port connection
- Includes carrying case, tools, cables, manual

$845
HDP500

1 Source → 2 Targets

OMNICLONE REPLIQUE 2

The OmniClone Replique 2 is the most portable way to copy to two native target drives.

- Dual target, IDE hard drive to hard drive duplication
- Compact—Smallest unit on the market
- Data transfer speeds exceed 800 MB/min
- Durable design—Metal case and heavy-duty removable hinge
- Any operating system—Scales FAT16, FAT32, and NTFS
- Comprehensive diagnostics features—data recovery, drive wipe, and scanning
- Removable lid for easy use
- Easily upgraded to Replique 5 with the Replique 2 Expansion Station (Targets 3,4 & 5) *(HDP502)* for $1795.00

$1,995
HDP501

1 Source → 5 Targets

OMNICLONE REPLIQUE 5

The Replique 5 package is a complete one-to-five solution, just plug it in and clone!

- Five target, IDE hard drive to hard drive duplication
- Compact—Smallest unit on the market
- Data transfer speeds exceed 800 MB/min
- Durable design—Metal case and heavy-duty removable hinge
- Any operating system—Scales FAT16, FAT32, and NTFS
- Comprehensive diagnostics features—data recovery, drive wipe, and scanning
- Modular—If one unit fails, you still have a 1 to 2

$3,650
HDP503

3 Sources → 15 Targets

OMNICLONE REPLIQUE 15

OmniClone Replique 15 clones up to 15 drives at once. The units can be detached and reassigned to fit workload needs. Comes with space saving docking station with sliding ball-bearing shelves.

- Fifteen target, three master, IDE hard drive to hard drive duplication
- Compact—Smallest unit on the market
- Data transfer speeds exceed 600 MB/min
- Durable design - Metal case and heavy-duty, ball bearing slides
- Any operating system—Scales FAT16, FAT32, and NTFS
- Comprehensive diagnostics features—data recovery, drive wipe, and scanning
- Modular—If one unit fails, you only lose two targets

$8,995
HDP505

OMNICLONE SOLITAIRE

Solitaire *HDP500*	$845.00
Solitaire OmniDiagnose *HDP506*	$99.00
Solitaire Extended Warranty (2 Years Total) *HDP531*	$195.00

OMNICLONE ACCESSORIES

OmniClone Adapter Kit 2.5" (1 Piece) *HDP522*	$39.95
OmniClone Adapter Kit 2.5" (3 Pieces) *HDP523*	$99.95
OmniClone Adapter Kit 2.5" (6 Pieces) *HDP524*	$179.95

OMNICLONE REPLIQUE 2

Replique 2 *HDP501*	$1995.00
Replique 2 Expansion Station (Targets 3,4 & 5) *HDP502*	$1795.00
Replique 2 Selective Partition *HDP507*	$395.00
Replique 2 OmniPrint *HDP508*	$395.00
Replique 2 NTFS Clever Copy *HDP509*	$395.00
Replique 2 OmniDiagnose *HDP510*	$395.00
Replique 2 Clone Pack (includes all options and carrying case) *HDP511*	$1195.00
Replique 2 Extended Warranty (2 Years Total) *HDP532*	$495.00
Replique 2 Case *HDP535*	$99.00

OMNICLONE REPLIQUE 5

Replique 5 *HDP503*	$3650.00
Replique 5 Selective Partition *HDP512*	$395.00
Replique 5 OmniPrint *HDP513*	$395.00
Replique 5 NTFS Clever Copy *HDP514*	$395.00
Replique 5 OmniDiagnose *HDP515*	$395.00
Replique 5 Clone Pack (includes all options and carrying case) *HDP516*	$1295.00
Replique 5 Extended Warranty (2 Years Total) *HDP533*	$695.00
Replique 5 Case (Requires purchase of 2 cases) *HDP536*	$99.00

OMNICLONE ACCESSORIES

OmniClone IDE and Power Cables (1 Piece) *HDP525*	$29.95
OmniClone IDE and Power Cables (3 Piece) *HDP526*	$74.95
OmniClone IDE and Power Cables (6 Piece) *HDP525*	$139.95
OmniClone IDE and Power Cables (30" x 1) *HDP528*	$39.95
OmniClone IDE and Power Cables (30" x 5) *HDP530*	$99.95

OMNICLONE REPLIQUE 10 / 15

Replique 10 (2 Master / 10 Target) *HDP504*	$6250.00
Replique 15 (3 Master / 15 Target) metal case and heavy-duty, ball bearing slides *HDP505*	*$8995.00*
Replique 10/15 Selective Partition *HDP517*	$395.00
Replique 10/15 OmniPrint *HDP518*	$395.00
Replique 10/15 NTFS Clever Copy *HDP519*	$395.00
Replique 10/15 OmniDiagnose *HDP520*	$395.00
Replique 10/15 Clone Pack (includes all options) *HDP521*	$1295.00
Replique 10/15 Extended Warranty (2 Years Total) *HDP533*	$795.00
Replique 10/15 Docking Station *HDP537*	$749.00

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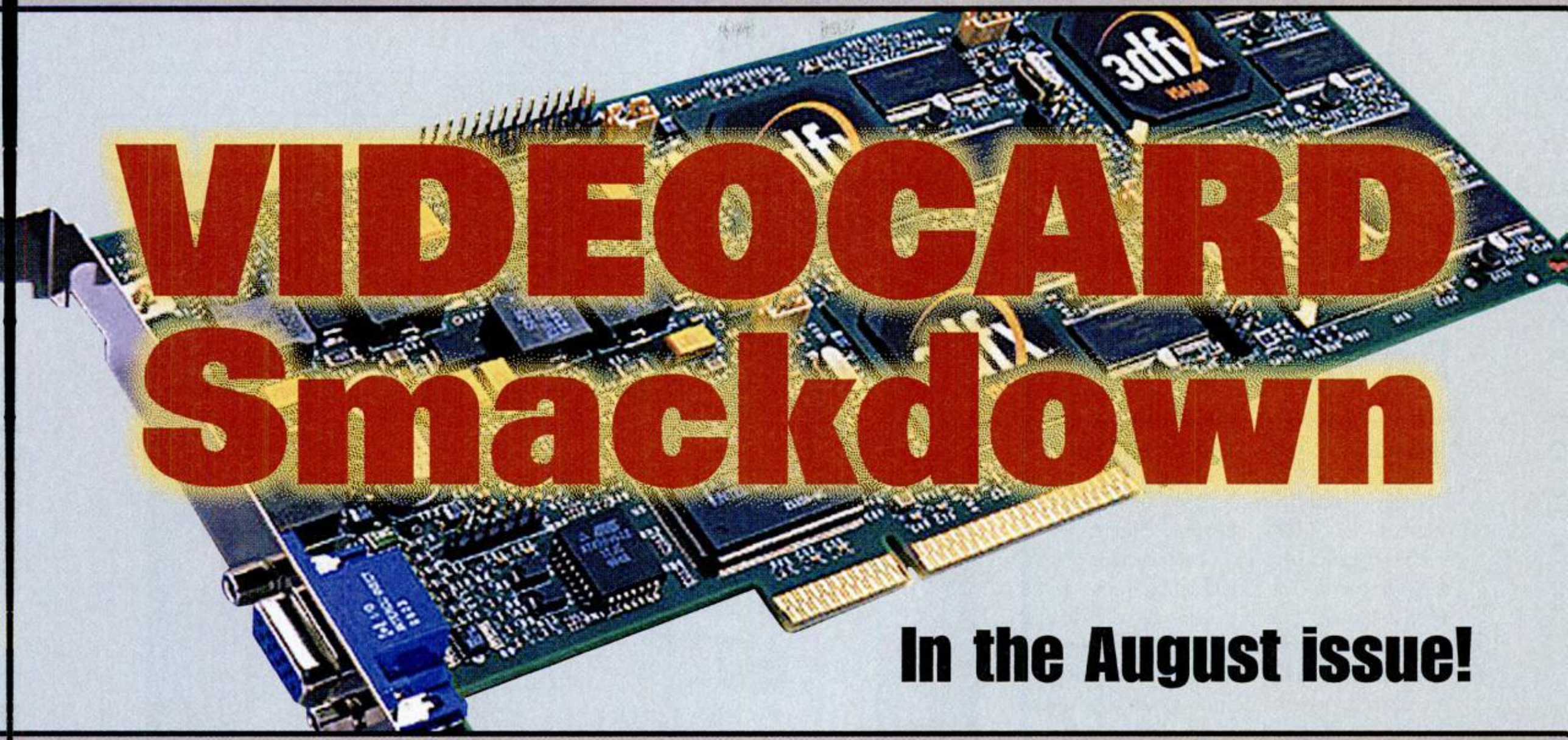

VIDEOCARD Smackdown

In the August issue!

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The Daily Glitch

Apex of Accuracy, Paragon of Truth * Monday, July 3, 2000

E3 Breast-to-Game Ratio: "We Must Do Better"

by Jon Phillips and Josh Norem

Due to a record low number of new game releases, the 2000 Electronic Entertainment Expo suffered a perilous imbalance in its breast-to-game ratio. The organization running the Expo estimates that for every game that was demoed on a console or computer screen, 2.7 pairs of scantily-clad breasts were bouncing on the show floor—and distracting attendees from the few games that were actually on display.

"B-to-G ratios must be very tightly monitored," said Expo organizer Grant Greenblat. "The breast must entice, but not distract. It must allure, but not divert. Ideally, we want the trade show John to say to himself, 'Well, well, well, what do we have here?' and before he can drop his proverbial chalupa, a specially designated floorwalker will reroute him to a demo station where we can poison his mind with snake oil and doublespeak."

Next year, Greenblat said, Expo organizers will more closely monitor game development cycles to keep breast-to-game ratios at more productive levels. "Ideally, we'd like to hit 1.7 pair of gazongas for every game; 1.6 or 1.5 would be a grand-slam."

Expo director Carol Tisdale said only low-quality tail kept the show from being a total disaster. "Thank goodness that much of the tail was skank," said Tisdale, "or we would have lost the attention of the propeller beanie contingent entirely."

In a related story, game developer Sick Duck Software is planning to hire fat dudes with their ass cheeks hanging out of Lycra cut-offs to hawk next year's E3 releases. That should gross everyone out, good and proper.

Relegated to the Booth Babe Penalty Box, these ladies were forced to wear t-shirts.

Intel Blames Flux Capacitor for Latest Chipset Recall

Just one month after recalling i820 motherboards due to a translator hub problem, Intel is facing another crisis. This time, the culprit is the i820 chipset's flux capacitor.

"The chipset isn't getting the requisite 1.21 jiggawatts of power needed to operate," said Doc Brown, Intel's wild-eyed chief engineer. "The chipset must reach 88GHz in order to achieve its peak performance level, allowing it to instantly surpass other chipsets made in the past, landing the i820 chipset squarely in the future," said the excitable Brown.

Brown is doubtful that Intel will find a way to supply the chipset its requisite power, explaining, "We'd have to somehow channel a lightning bolt and send the 1.21 jiggawatts straight to the PC's power supply at the exact moment the frontside bus hits 88GHz."

Brown's assistant, a young man wearing what appeared to be a lifejacket, described the chipset problem as "heavy."

Editor Needs New Synonyms For "Suck"

Forever banned from using the word "smackdown" in product critiques, *Maximum PC* Reviews Editor Josh Norem is in desperate need for other ways to express his disapproval of components that suck.

"One component can no longer 'lay the smackdown' on another component, as per Herr Kommadant Phillips' decree," said Norem. "So now I need other ways to describe a product's sheer sucktitude. I've already used up all analogies to bad products being anally raped in prison scenarios, and I've already compared too many terrible products to *Trespasser*. "

If you'd like to donate a synonym for suck to the Help Josh Norem Suck Foundation, email your donations to yousuck@maximumpc.com.

PC Cooking Tip of the Day
Oeuf a la Carmack
• Ingredients: 1 large egg, one dash dill, one tsp. shallot, butter.
• Directions: In a small bowl, beat egg. Add dill and diced shallot. Coat heatsink of 0.25-micron Pentium III or Athlon with butter. Begin *Quake II* multiplayer deathmatch. Apply contents of mixing bowl to heatsink. Cook three minutes. Enjoy!*(Note: If you're cooking at high altitudes, you might need to substitute Quake II for Quake III.)*

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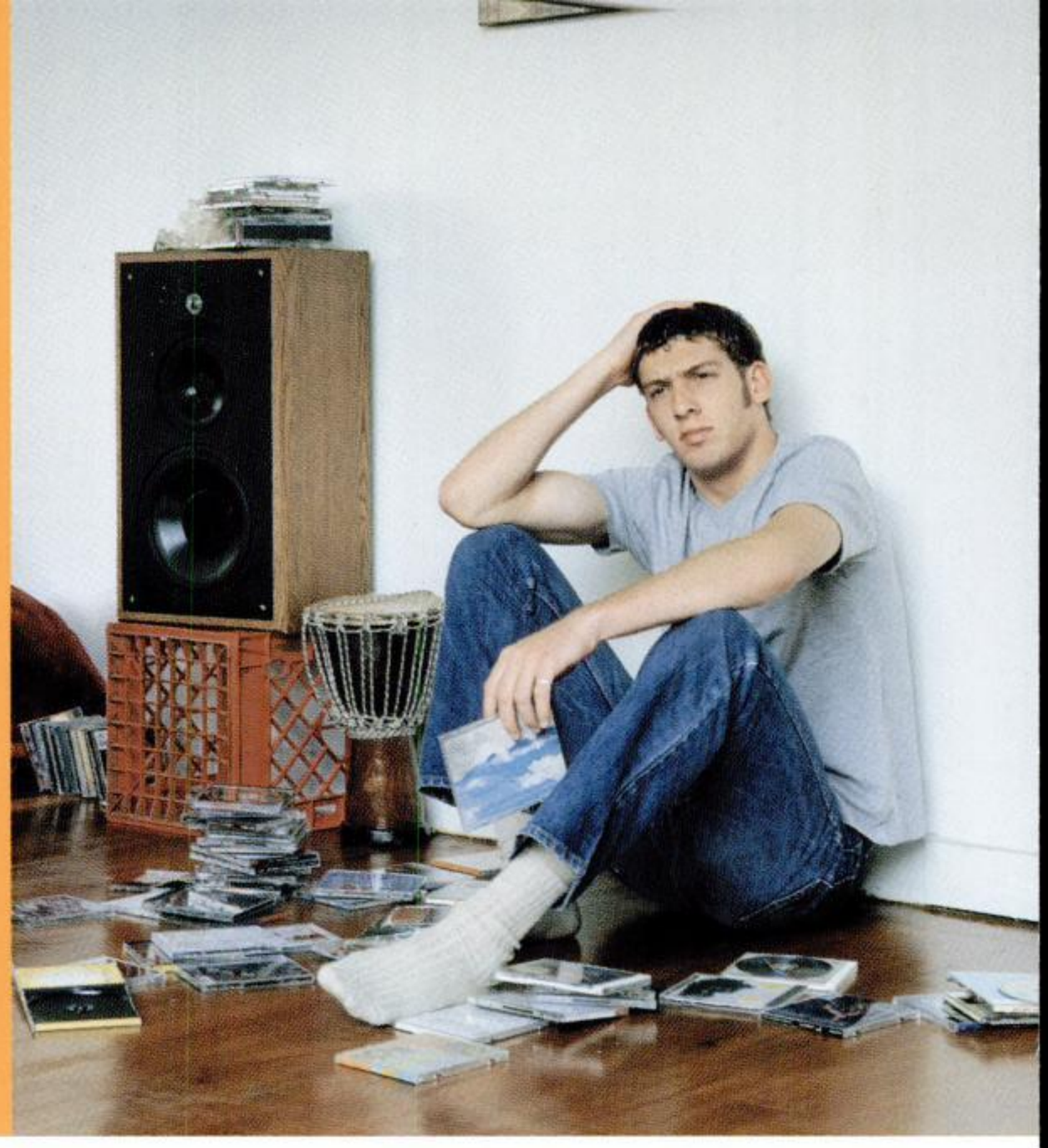

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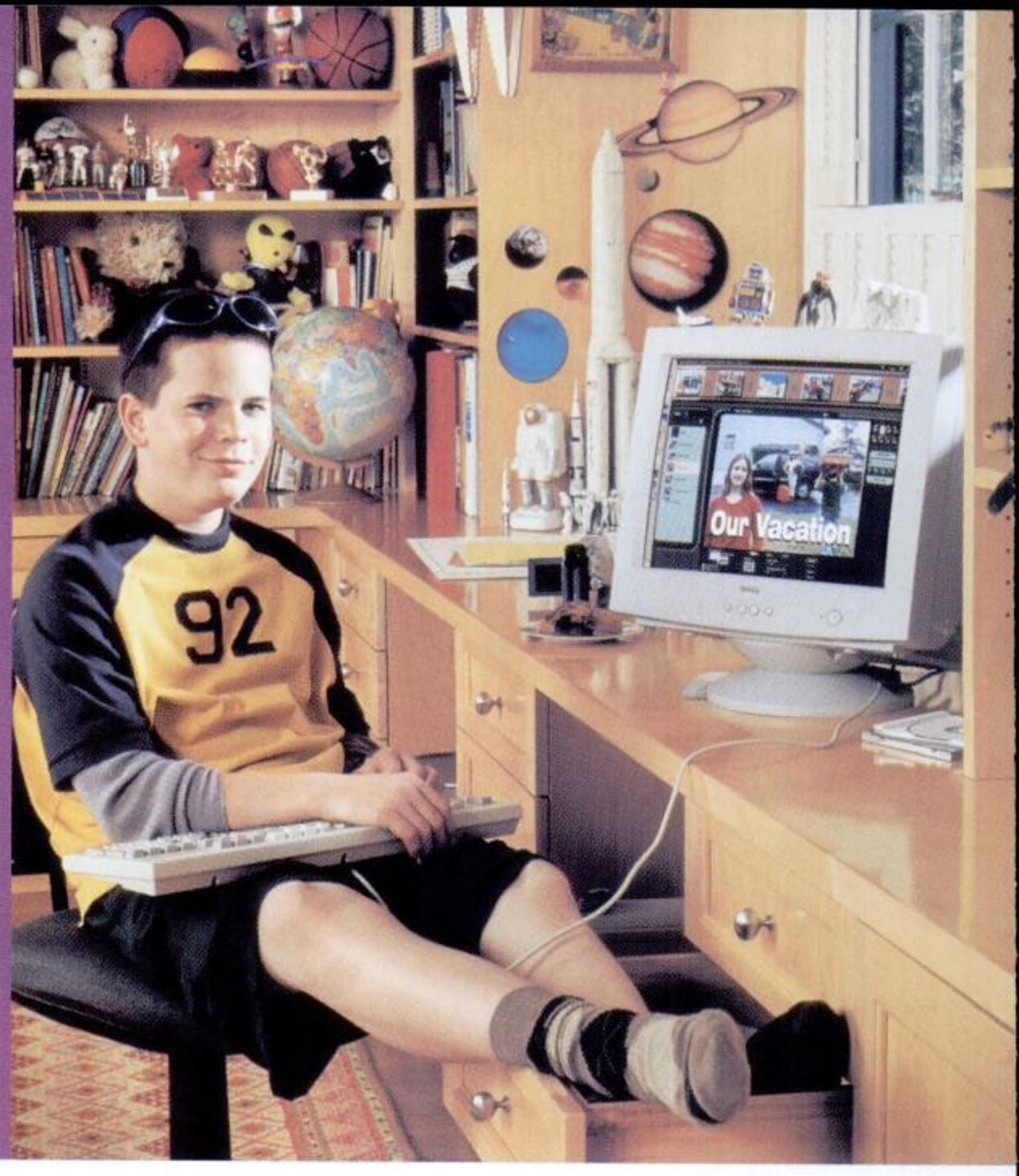

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